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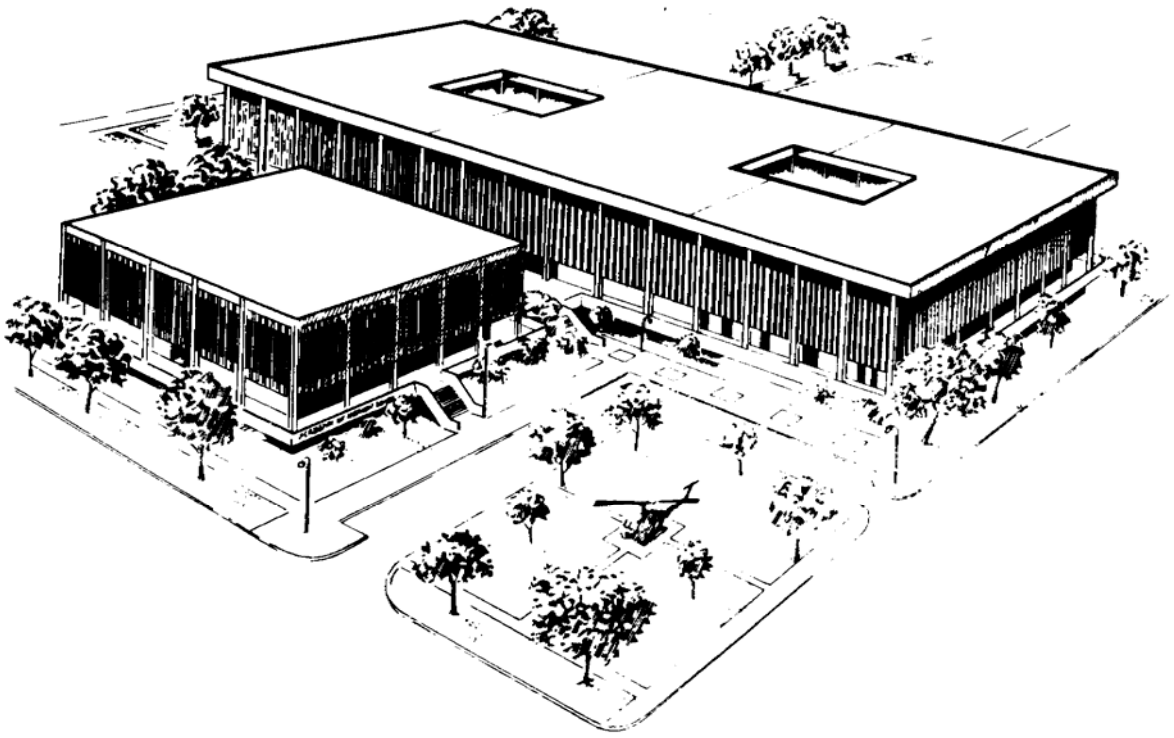
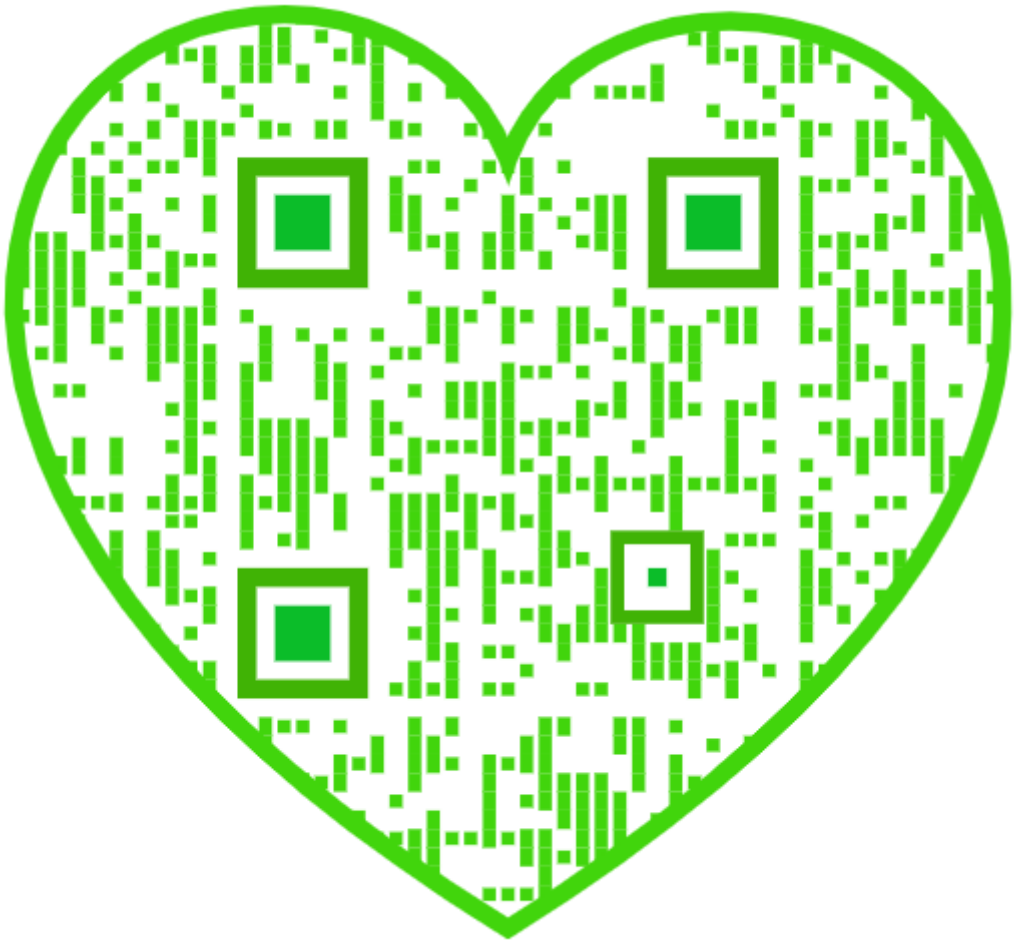


TAKING VITAL SIGNS

SUBCOURSE MD0531 EDITION 200



DEVELOPMENT

This subcourse is approved for resident and correspondence course instruction. It reflects the current thought of the Academy of Health Sciences and conforms to printed Department of the Army doctrine as closely as currently possible. Development and progress render such doctrine continuously subject to change.

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CLARIFICATION OF TRAINING LITERATURE TERMINOLOGY

When used in this publication, words such as "he," "him," "his," and "men" are intended to include both the masculine and feminine genders, unless specifically stated otherwise or when obvious in context.
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CORRESPONDENCE COURSE OF THE
U.S. ARMY MEDICAL DEPARTMENT CENTER AND SCHOOL

SUBCOURSE MDO531

TAKING VITAL SIGNS

INTRODUCTION

Vital (life) signs are very important. They tell you and other medical personnel about the patient's present condition. Be maintaining a record of a patient's vital signs, the effectiveness of the medical treatment that the patient receives can be evaluated. This subcourse provides you with information you need in order to take a person's vital signs.

Subcourse Components:

The subcourse instructional material consists of the following:

Lesson 1, Initial Assessment.
Lesson 2, Temperature.
Lesson 3, Pulse.
Lesson 4, Respiration
Lesson 5, Blood Pressure
Lesson 6, Recording VItal Signs.

Study Suggestions:

Here are some suggestions that may be helpful to you in completing this subcourse:

--Read and study each lesson carefully.

--Complete the subcourse lesson by lesson. After completing each lesson, work the exercises at the end of the lesson, marking your answers in this booklet.

--After completing each set of lesson exercises, compare your answers with those on the solution sheet that follows the exercises. If you have answered an exercise incorrectly, check the reference cited after the answer on the solution sheet to determine why your response was not the correct one.

Credit Awarded:

To receive credit hours, you must be officially enrolled and complete an examination furnished by the Nonresident Instruction Branch at Fort Sam Houston, Texas. Upon successful completion of the examination for this subcourse, you will be awarded 8 credit hours.

You can enroll by going to the web site http://atrrs.army.mil and enrolling under "Self Development" (School Code 555).

A listing of correspondence courses and subcourses available through the Nonresident Instruction Section is found in Chapter 4 of DA Pamphlet 350-59, Army Correspondence Course Program Catalog. The DA PAM is available at the following website: http://www.usapa.army.mil/pdffiles/p350-59.pdf.

LESSON ASSIGNMENT

LESSON 1	Initial Assessment.
LESSON ASSIGNMENT	Paragraphs 1-1 through 1-6.
LESSON OBJECTIVES	After completing this exercise you should be able to:
	1-1. Identify the vital signs.
	1-2. Complete an initial assessment.
	1-3. Establish patient contact.
	1-4. Assess the skin.
	1-5. Assess the level of consciousness.
	1-6. Take a SAMPLE history.
SUGGESTIONS	After completing the assignment, complete the exercises at the end of this lesson. They will help you to accomplish the lesson objectives.

1-1. WHAT ARE "VITAL SIGNS"?

Following the initial assessment and control of any immediate life threats, you will begin a more thorough assessment of your patient. Two essential elements of this assessment will be measuring vital signs and obtaining a medical history. Vital signs are measurable life signs. The term "vital signs" usually refers to the patient's temperature, pulse, breathing, and blood pressure. Because they reflect the patient's condition, you must take them early and repeat them often. The medical history includes information about the present medical problem and facts about the patient that existed before the patient required emergency medical response. This information can affect the treatment you give. It is called a SAMPLE history because the letters in the word SAMPLE stand for elements of the history.

1-2. INITIAL ASSESSMENT AND SAMPLE HISTORY

a. A thorough, properly sequenced rapid assessment is essential to identifying a patient's needs and providing proper emergency care. To assess a patient, the combat medic must gather, evaluate, and record key information including the patient's vital signs, injuries, and symptoms and the conditions leading to the illness or injury. The combat medic must learn the history of what happened before and since the accident or medical problem occurred and learn the patient's past medical history and overall health status. Assessment is a process which must be taught in steps in order to establish good assessment habits and a systematic approach in order to avoid missing important injuries or illnesses. In the field, many aspects of the patient assessment may be done simultaneously.

b. Assessment is one of the most complex skill's that must be learned to be an effective combat medic. During the assessment, the combat medic must use his eyes, ears, nose, hands, and a few basic medical instruments to obtain essential information about the patient.

1-3. ESTABLISH PATIENT CONTACT

a. After assessing the scene for safety and determining the need for additional help, the number of patients, the mechanism of injury or nature of illness, and considering the need for cervical spine immobilization, the combat medic must make contact with the patient. The patient is assessed for ABC's and his level of consciousness; then you can begin questioning your patient for vital information about the current medical problem with which you are concerned. This is the "chief complaint."

b. The chief complaint is the major signs, symptoms, or events that caused the illness or injury. Symptoms are conditions that the patient feels and tells you about, such as dizziness or particular pain. Symptoms are the subjective information you obtain from you patients. Signs can be seen, heard, felt, smelled, or measured, such as wounds, external bleeding, deformities, breathing rate, and pulse. You must be able to record and report how and when the signs and symptoms began.

c. Initial assessment is a rapid evaluation of the patient's general condition to identify any potentially life-threatening injuries or conditions.

(1) Repeated vital signs will be compared to the baseline set.

(2) Vital signs are key indicators used to evaluate and determine the patient's overall condition. Because key indicators include quantitative (numeric) measurement, vital signs always include breathing, pulse, and the blood pressure.

(a) The first vital sign is breathing. Breathing is discussed in Lesson 4.

(b) The second vital sign is the pulse. The pulse is discussed in Lesson 3.

(c) The third vital sign is the blood pressure. Blood presser is discussed in Lesson 5.

(d) Other key indicators include:

1 Skin temperature and condition in adults.

2 Capillary refill time (in children).

3 Pupillary response.

4 Level of consciousness (LOC).

1-4. ASSESSING THE SKIN

The skin is an easily observed indicator of the peripheral circulation and perfusion, blood oxygen levels, and body temperature. The skin color, temperature, and condition are good indicators of the patient's condition and circulatory status. They may also be good initial indicators of heat or cold injuries. This initial indicator should always be confirmed, when time permits, with a core body temperature (see Lesson 2).

a. **Color**.

(1) Many blood vessels lie near the surface of the skin.

(2) Pigmentation in individuals will not hide changes in the skin's underlying color.

(3) In lightly pigmented individuals, skin normally has a pink color.

(4) In patients with deeply pigmented skin, changes in skin color may only be apparent in certain areas, such as the fingernail beds, the lips, the mucous membranes in the mouth, the underside of the arm and hand, and the conjunctiva of the eye.

(5) Poor peripheral circulation will cause the skin to appear pale, white, ashen, gray, or waxy and translucent like a white candle. These skin colors can also appear in abnormally cold or frozen skin.

(6) When the blood is not properly saturated with oxygen, it changes to a bluish color. Skin over the blood vessels appears blue or gray, a condition called cyanosis.

(7) Red skin will result from carbon monoxide poisoning, significant fever, heatstroke, sunburn, mild thermal burns, or other conditions in which the body is unable to properly dissipate heat.

(8) Color changes may also result from chronic illness. Liver disease dysfunction may cause jaundice, resulting in a yellow cast to the skin.

b. **Temperature**.

(1) Normally, the skin is warm to the touch.

(2) The skin feels hot with significant fever, sunburn, or hyperthermia.

(3) The skin feels cool in early shock, profuse sweating, heat exhaustion, and profound hypothermia and/or frostbite.

(4) Feel the patient's forehead with the back of your ungloved hand to determine marked fever.

c. **Moisture**.

(1) The skin is normally dry.

(2) Wet, moist, or excessively dry and hot skin is considered abnormal.

(3) In descriptions of the skin, it is usually listed as color, condition, and temperature (CCT).

d. **Capillary Refill**. Capillary refill can be assessed as part of the evaluation of the skin.

(1) Capillary refill is used to evaluate the ability of the circulatory system to restore blood to the capillary system (perfusion). Capillary refill is used primarily in the assessment of pediatric patients. Refill time in adults is not considered as accurate due to differences in circulation from medications and various other factors. This can still be used as a simple test of perfusion to the extremities, but many factors must be considered, such as the age of the patient and the environment (cold will decrease capillary refill time).

(2) Capillary refill is evaluated at the nail bed in a finger.

(a) Place your thumb on the patient's fingernail and gently compress.

(b) Pressure forces blood from the capillaries.

(c) Release the pressure and observe the fingernail.

(d) As the capillaries refill, the nail bed returns to its normal deep pink color.

(e) Capillary refill should be both prompt and pink.

(f) Color in the nail bed should be restored within 2 seconds, about the time it takes to say "capillary refill."

1-5. ASSESSING LEVEL OF CONSCIOUSNESS

Level of consciousness should also be assessed upon initial contact with your patient and continuously monitored for changes throughout your contact with the patient.

a. **AVPU**. The AVPU scale is a rapid method of assessing LOC. The patient's LOC is reported as A, V, P, or U.

(1) A: Alert and oriented.

(a) Signifies orientation to person, place, time, and event. Ask your patient simple open ended questions that can not be answered with yes or no to determine the LOC. For example, “Where are you right now?” and “What time is it?” Do not ask your patient, “Do you know were you are right now?” since this can be answered with a yes or no.

(b) If the patient is alert, you can reported your results as a patient oriented score from 1 (lowest) to 4 (highest), noting any areas not oriented to. For example, you can state the patient is "A and O X 4" (fully alert and oriented) or "A and O x 2 and does not know time and place."

(2) V: Responds to verbal stimulus. This indicates that your patient only responds when verbally prompted. It is also important to note if the patient makes appropriate or inappropriate responses. If you ask your patient, “What is your name?” and he responds with, “Flaming monkeys,” this would be an inappropriate response and shows that although he responds to verbal, he is not appropriately oriented.

(a) Response to normal voice stimuli.

(b) Response to loud voice stimuli.

(3) P: Responds to pain.

(a) Use if patient does not respond to verbal stimuli.

(b) Gently but firmly pinch patient’s skin.

(c) Note if patient moans or withdraws from the stimulus.

(4) U: Unresponsive.

(a) If the patient does not respond to painful stimulus on one side, try the other side.

(b) A patient who remains flaccid without moving or making a sound is unresponsive.

NOTE: Anything below Alert is unconscious; from there we need to determine how unconscious the patient is. A patient can be unconscious with response to stimuli or unresponsive.

b. **Glasgow Coma Scale**. The Glasgow Coma Scale is an assessment based on numeric scoring of a patient's responses based on the patient's best response to eye opening, verbal response, and motor response. The patient's score (3 to 15) is determined by adding his highest eye opening, verbal response, and motor response scores.

(1) Eye opening (1 to 4 points).

(a) Spontaneous: E4. Eyes are open and focused; the patient can recognize you and follow eye movements.

(b) To voice: E3. The patient opens his eyes when spoken to or when directed to do so.

(c) To pain: E2. The patient opens his eyes when given some sort of painful stimuli.

(d) None: E1.

(2) Verbal response (1 to 5 points).

(a) Oriented: V5. The patient can talk and answer questions about his location, time, and who he is. In some situations, it is also appropriate to question the patient to see if he is oriented to the event that led him to be in his current condition.

(b) Confused: V4. The patient can talk and speak coherently, but is not entirely oriented to person, place, time, and event.

(c) Inappropriate words: V3. The patient answers with some sort of inappropriate response to the question that was asked or answers with excessive use of profanity that is not associated with anger toward the event.

(d) Incomprehensible words: V2. Unintelligible words or sounds.

(e) None: V1

(3) Motor response (1 to 6 points).

(a) Obeys command: M6. The patient can follow appropriate commands or requests. It is also important to asses the patient for the ability to follow commands across the central plane of the body. For example, the command, "Please touch your left shoulder with your right arm," helps to ensure the patient can cross the hemispheres of the brain since the left and right sides of the body are controlled by the opposite sides of the brain.

(b) Localizes pain: M5. Can the patient localize the pain that he is feeling? If you elicit a pain response by pinching of squeezing the right side, watch for the patient to reach across with the opposite arms to check for cross body localization.

(c) Withdraws to pain: M4. This indicates a correct pain response. The body should withdraw away from the pain and not towards it.

(d) Flexion (decorticate posturing): M3. This is an abnormal posturing usually caused by severe brain trauma. The body curls into a protective posture by flexing the arms into the chest.

(e) Extension (decerebate posturing): M2. In this form of posturing, the body is abnormally extended. The arms and legs may be extended and very rigid or difficult to move.

(f) None: M1.

c. **PEARRL**. Use the guide PEARRL when assessing the pupillary response of the patient's eyes.

(1) P: Pupils. Are they both present? What is their general condition?

(2) E: Equal. Are both pupils the same size? Unequal pupils can indicate a head injury causing pressure on the optic nerve. There is a small percent of the population that has unequal pupils normally, so a good patient history is critical.

(3) A: And.

(4) R: Round.

(5) R: Regular in size.

(6) L: React to light. Both eyes should be assessed twice for reaction to light. The first time the light is shined in the right eye, for example, you should watch the right eye for reaction, the second time the left eye should be watched to ensure sympathetic eye movement is present. (both eyes are doing the same thing at the same time).

d. **Vital Signs**.

(1) The first set of vital signs establishes an important initial measurement of the patient’s condition and serves as a key baseline.

(2) Monitor vital signs for any changes from initial findings throughout care.

(3) Reassess and record vital signs at least every 15 minutes in a stable patient and at least every 5 minutes in an unstable patient.

(4) Reassess and record vital signs after all medical interventions.

1-6. SAMPLE HISTORY

SAMPLE is an acronym used to help determine a patient's history of the current illness. SAMPLE history is very important in that will help you to determine some of the patient's key complaints. In the medical patient, a good history will help determine about 80 percent of the indications of what illness you are dealing with. During the SAMPLE history, it is also important to determine what allergies and medications the patient may have. This is a very important step in the treatment of any patient.

a. **Signs and Symptoms**. Signs are the things you can see about the patient's condition. Symptoms are what the patient tells you about his condition. Use OPQRST to help determine the patient's history.

(1) O -- Onset of the current condition, What were you doing when this happened? Did it come on suddenly? Did it come on slowly?

(2) P-- Provokes. What makes this condition better or worse? Did this get better when you rested? Took a medication?

(3) Q -- Quality. What is the quality of the pain? Have the patient describe in his own words what the pain feels like (stabbing, pressure, tearing, crushing, etc.). Try not to lead the patient by asking questions like, “Is it a stabbing pain?”

(4) R -- Radiation. Does the pain radiate? Or is it located in one specific area?

(5) S -- Severity. This is usually assessed by having the patient rate the pain on a scale of 1 to 10 with 10 being the worse. It is necessary to ask the patient about the worst pain they have ever felt to obtain a good basis for their pain threshold and previous pain exposure.

(6) T -- Time, How long has it been since the pain started?

b. **Allergies**. Is the patient allergic to medications, food, or other substances?

c. **Medication**. What medications is the patient currently taking? Make sure to ask about over-the-counter medications, herbal medications, and supplements that the patient may be taking.

d. **Pertinent Past History**. Does the patient have any pertinent medical history? Anything that the patient may feel is applicable to the current illness or injury?

e. **Last Oral Intake**. When did the patient last eat or drink?

f. **Events Leading to the Injury or Illness**. What events lead to this incident? What where you doing just before the event happened or started?

Continue with Exercises

EXERCISES: LESSON 1

INSTRUCTIONS. The following exercises are to be answered by marking the lettered response that best answers the question or best completes the incomplete statement or by writing the answer in the space provided. After you have completed all the exercises, turn to "Solutions to Exercises" at the end of the lesson and check your answers.

1. Vital signs include the patient's _____- , _____ ,

   _____ , and _____ .

2. You are obtaining a patient's SAMPLE history. What do the letters in SAMPLE mean?

   S _____

   A _____

   M _____

   P _____

   L _____

   E _____

3. In the AVPU method of evaluating the patient's level of consciousness, what does each letter stand for?

   A _____

   V _____

   P _____

   U _____

4. Your patient does not respond when you question him about his name, where he is, what day it is, or what has happened. However, he shows a pain response to a wound on his leg and will follow the simple command, "Raise your right arm," when you yell at him. How would you classify this person on the AVPU scale?

   _____

5. Score the following patient using the Glasgow Coma Scale.

   _____ The patient opens his eyes when spoken to or when directed to do so.

   _____ The patient answers questions with responses inappropriate to the questions.

   _____ The patient can localize the pain that he is feeling.

   _____ Total Glasgow score.

Check Your Answers on Next Page

SOLUTIONS TO EXERCISES: LESSON 1

1. Temperature, pulse, breathing, and blood pressure (any order) (para 1-1)

2. Signs and symptoms
   Allergies
   Medication
   Pertinent past history
   Last oral intake
   Events leading to injury or illness (para 1-6)

3. A--Alert and oriented
   V-- Responds to verbal stimulus
   P-- Responds to pain.
   U-- Unresponsive.

4. V-- Responds to verbal stimulus

5 E3
   V3
   M5
   11

End of Lesson 1

LESSON ASSIGNMENT

LESSON 2	Temperature.
LESSON ASSIGNMENT	Paragraphs 2-1 through 2-25.
LESSON OBJECTIVES	After completing this lesson, you should be able to:

2-1. Identify normal and abnormal temperatures.

2-2. Identify factors that affect a person's body temperature.

2-3. Determine the temperature shown on a glass thermometer.

2-4. Identify when oral, rectal, and axillary temperatures are taken.

2-5. Distinguish between oral and rectal thermometers.

2-6. Identify the proper procedures for taking a patient's oral, rectal, and axillary temperatures with a glass thermometer.

2-7. Identify the proper procedures for taking a patient's oral and rectal temperatures with an electric thermometer.

2-8. Identify and apply rules for recording patients' temperatures.

2-9. Identify the proper procedure for decontaminating glass thermometers.

SUGGESTIONS After completing the assignment, complete the exercises at the end of this lesson. They will help you to accomplish the lesson objectives.

LESSON 2

Section I. GENERAL INFORMATION

2-1. WHY IS IT IMPORTANT TO KNOW THE PATIENT'S TEMPERATURE?

a. **To Determine the Cause of the Patient's Condition.** When a person becomes ill, one of the first things that must be done is to determine what disease, injury, or other factor is responsible. Some problems, such as pneumonia and heatstroke, cause the body to become warmer than normal. Some problems, such as generalized hypothermia and some forms of shock, cause the body to become cooler than normal. Many other problems will have little or no effect upon the body's temperature. Determining whether the patient's temperature is normal, higher than normal, or lower than normal can be important in determining what is wrong with the patient.

b. **To Determine the Effectiveness of Treatment.** If the patient's condition has caused his body to become warmer or cooler than normal, then his temperature should return to normal as he becomes healthier. Change or lack of change in the patient's temperature may indicate if the treatment being used is actually working.

2-2. WHAT IS A "NORMAL" TEMPERATURE?

The average body temperature (measured orally) of the average healthy human being is 98.6ºF (37.0º C). This does not mean that everyone should always have a temperature of 98.6º F. An individual's normal temperature may be slightly higher or slightly lower. A body temperature between 96.8º F and 100.4º F is considered to be within the normal temperature range.

2-3. WHY IS "NORMAL TEMPERATURE" GIVEN AS A RANGE?

Why is it necessary to have a normal temperature range? Why isn't a temperature of 98.6º F normal and everything else is abnormal? The reason is that a person can have a body temperature that is slightly above or below 98.6 F and still be normal and healthy. Some of the factors that make it necessary that "normal" temperature be defined as a range are given below.

a. **People Have Different "Normal Temperatures."** Remember that 98.6º F is the average normal temperature. Some people have normal temperature that is slightly higher than average while others have normal temperature that is slightly lower than average.

(1) A person whose normal body temperature is above average (such as 99.0º F) is said to have a "high-normal" body temperature.

(2) A person whose normal body temperature is below average (such as 97.6º F) is said to have a "low-normal" body temperature.

b. **Menstrual Cycle Affects Body Temperature.** A woman's body temperature drops slightly before ovulation, rises about 1º F above normal during ovulation, and then returns to her normal level.

c. **Pregnancy Affects Body Temperature.** During pregnancy, a woman's body temperature stays above her regular normal temperature.

d. **Physical Activity Affects Body Temperature.** When a person exercises or does hard work, his muscles change stored energy supplies in the body (mainly glucose and fat) into usable energy. When the body's muscles change stored energy into usable energy, heat is given off. This is why you can warm up in cold weather by doing exercises.

e. **Age Affects Body Temperature.**

(1) A newborn baby has some difficulty in adjusting his body temperature. His temperature may be slightly high one time and slightly low the next. By the time, the baby is one year old, the parts of his body that control his body temperature are fully developed and his normal body temperature has been established.

(2) An elderly person will usually have a low-normal body temperature. The lower body temperature is caused by changes within his body and by a decrease in physical activity.

f. **Weather Affects Body Temperature.** When a person's body is exposed to hot weather, his body temperature rises. When a person's body is exposed to cold weather, his body temperature drops. In the cold environment the body loses heat in the following five ways.

(1) Conduction. Conduction is the direct transfer of heat from a part of the body to a colder object. For example, when a warm hand touches cold metal or ice, or when a person's hand is immersed in water with a temperature below his body temperature. Heat passes directly from the body to the colder object.

(2) Convection. Convection occurs when heat is transferred to circulating air, as when cool air moves across the surface of a person's body. A person who is standing outside in windy winter weather and who is wearing lightweight clothing is losing heat to the environment mostly by convection.

(3) Evaporation. Evaporation is the conversion of any liquid to a gas. The evaporation process requires energy (heat). Evaporation is the natural mechanism by which sweating cools the body. This is why swimmers coming out of the water feel a sensation of cold as the water evaporates from their skin. Individuals who exercise vigorously in a cool environment may sweat and feel warm at first, but later, as their sweat evaporates, they can become exceedingly cool.

(4) Radiation. Radiation is the loss of body heat directly to colder objects in the environment. Because heat always travels from a warm object to a cooler one, a person standing in a cold room will lose heat by radiation.

(5) Breathing. Breathing causes body heat to be lost as warm air in the lungs is exhaled into the atmosphere and cooler air is inhaled.

NOTE: If a person is working in an area that is hot due to the type of work being done, such as in a steel mill, his body temperature will rise since the hot environment is his "weather."

g. **Time of Day Affects Body Temperature.** A person's body temperature is usually lower in the morning than in the afternoon. This change is mainly due to warmer weather and more physical activity occurring later in the day.

h. **Emotions Affect Body Temperature.** A person that is excited (joyful, scared, angry, and so forth.) will have an increase in body temperature. The excitement causes the body to increase the rate at which it changes stored food (glucose and fat) into usable energy. As the energy output increases, so does the amount of heat produced by the body.

i. **Place of Measurement Affects Measurement.** The three locations normally used in determining the body temperature are the mouth (oral temperature), the rectum (rectal temperature), and the armpit (axillary temperature). If you measured a person's body temperature using all three of these methods, you would obtain three slightly different temperatures. The axillary (armpit) temperature would be slightly lower than the oral (mouth) temperature while the rectal (rectum) temperature would be slightly higher than the oral temperature. The rectal temperature is considered an essential measurement in the hypothermic (cold injury) or hyperthermic (heat injury) patient. All other methods of obtaining the body temperature are not considered accurate for the pre-hospital or battlefield environment when dealing with environmental injuries. The oral and axillary methods should be used for the clinical or field sick call settings only.

2-4. HOW IS A PERSON'S BODY TEMPERATURE REGULATED?

a. **Hypothalamus.** Human beings, like other mammals, have bodies that stay about the same temperature even when the outside (environmental) temperature changes. The body's temperature stays constant because it is constantly monitored by a small area inside the brain called the hypothalamus (hi-po-THAL-ah-mus). When the body begins to cool, the hypothalamus causes the body to produce more heat. When the body becomes too warm, the hypothalamus causes the body to loose heat faster. These heating and cooling actions are very important since tissue damage and even death can result if the body gets too cold or too hot. The hypothalamus receives information concerning the body's temperature from several sources.

(1) Skin. One source of temperature information is the skin. The skin contains many nerves that have special functions. Some nerves protect the body by providing information in the form of pain. Other nerves provide the sense of touch. The hypothalamus uses two other types of nerves. One type senses heat while the other senses cold. These nerves provide information concerning the temperature of the environment.

(2) Hypothalamus. An important source of information concerning the body's actual temperature comes from the hypothalamus itself. Part of the hypothalamus can sense the temperature of the blood flowing through the hypothalamus. During a hyperthermic emergency such as heatstroke, the hypothalamus can be overwhelmed and temporarily shut down, causing the body to lose its ability to cool the body.

b. **Cooling Reactions.**

(1) Perspiration increases. When perspiration (sweat) on the skin evaporates, the process uses some of the body's heat. The hypothalamus causes the body to perspire more. This increased rate of perspiration then results in more body heat being lost through evaporation.

(2) Blood vessels enlarge. Blood vessels near the surface of the skin loose heat to the environment. The hypothalamus causes these blood vessels to become larger (dilate) when the body is too warm. When the blood vessels enlarge, they loose heat faster. This enlargement causes the skin to have a reddish (flushed) appearance.

c. **Warming Reactions.**

(1) Muscle activity increases. When the large muscles of the body are active, heat is produced. When the body becomes too cool, the hypothalamus causes the large muscles to contract and relax. These contractions and relaxations cycles, called shivers, produce body heat.

(2) Blood vessels contract. When the body is loosing too much heat, the hypothalamus causes the blood vessels near the surface of the skin to contract (become smaller). The blood vessels' decrease in size causes the vessels to loose heat slower than normal. The contraction of the blood vessels causes the skin to look pale.

2-5. WHAT CAUSES ABNORMAL TEMPERATURES?

When a person's body temperature is not within the normal temperature range, the cause is usually an infection or a dangerous environmental condition.

a. **Infection.** An infection occurs when the body is invaded by harmful microorganisms. When an infection occurs, the body attempts to destroy the invading microorganisms. One method used by the body is raising the body's temperature to a point where the invading microorganisms will be weakened or destroyed. When a person has a body temperature above his normal body temperature, he is said to have a fever. Another name for fever is pyrexia. Pyrexia comes from the Greek word "pyr," which means "on fire."

b. **Environmental Conditions.** Even though the body can maintain a normal body temperature under most weather conditions, very hot or very cold conditions can cause the hypothalamus to work improperly.

(1) Heatstroke. Sometimes the body cannot get rid of body heat fast enough and the body temperature rises. This condition is most likely to happen when a person is performing hard work in a hot climate. The rising body temperature is too much for the hypothalamus to handle and it begins to lose control of the body's cooling mechanisms. When the body stops perspiring, the body temperature continues to rise. This condition is known as heatstroke. The person will usually lose consciousness. Rapid cooling of the body is essential in the preventing major organ damage and death in the heatstroke patient.

(2) Generalized hypothermia. Generalized hypothermia refers to the lowering of the body temperature below normal levels. Death will result if the body temperature is not restored. For example, suppose a person falls off a ship into cold ocean water. The body looses heat to the cold water faster than the body can produce heat. If the person is removed from the cold conditions (pulled out of the water onto a boat, for example), the body may not be able to warm itself. In such a case, an outside source of heat (such as another person lying body to body with the victim) is needed to restore normal body temperature to the victim until the hypothalamus is functioning properly again. The body must be warmed slowly and in a controlled environment to prevent overwhelming of the body's system.

Section II. THERMOMETERS

2-6. HOW IS A PERSON'S TEMPERATURE DETERMINED?

A person's body temperature is measured using an instrument called a thermometer. The word "thermometer" comes from the Greek word *therme* (heat) and the French word *metre* (measure). There are two general types of thermometers--the glass thermometer and the electric thermometer. The glass thermometer is easier to carry than the electric thermometer and is cheaper to replace. The electric thermometer measures temperatures faster and does not have to be sterilized after each use as does the glass thermometer.

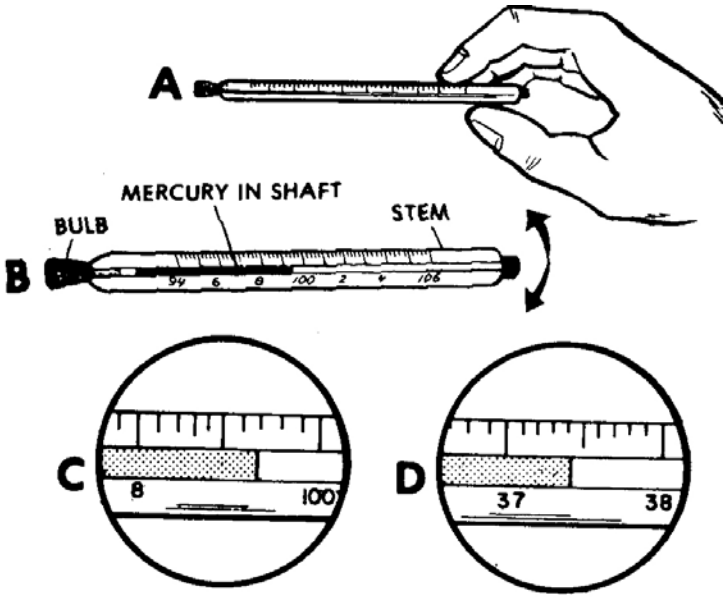
2-7. HOW DOES A GLASS THERMOMETER WORK?

A glass thermometer consists of a stem and bulb. The stem (long part) of the thermometer has a hollow shaft running almost the entire length of the stem. The bulb of the thermometer contains a small amount of mercury, a metal that is liquid at ordinary temperatures. The thermometer is designed so that mercury from the bulb can enter the hollow shaft in the stem. If you hold the mercury thermometer so that the bulb is pointed up; however, the mercury will not flow into the shaft. The mercury only enters the shaft if the mercury in the bulb expands and some of the mercury is forced into the shaft. The mercury is cooler than body temperature. When the thermometer bulb is placed next to body tissue, the mercury absorbs some of the body's heat. As the mercury gets warmer, it expands. Since the mercury has no more room in the bulb, some of the mercury is forced into the shaft. More and more mercury is forced into the shaft until the mercury reaches the same temperature as the body tissue and stops expanding. The patient's temperature is determined by measuring how much the mercury expanded.

2-8. HOW DO I READ A GLASS THERMOMETER?

Reading the glass thermometer (that is, determining the temperature shown) is done by holding the thermometer horizontally by the stem end (the end opposite the bulb) at eye level and rotating the thermometer until the mercury in the shaft can be clearly seen. This procedure is discussed below.

a. **Hold the Thermometer at Eye Level.** You must hold the thermometer at the end of the stem, not the bulb end. (If you held the bulb end, your body heat could cause the temperature reading to increase if the temperature of your fingers is greater than the temperature shown on the thermometer.) Normally, the end of the thermometer is held with the fingertips of the right hand as shown in figure 2-1 A. The thermometer should be held at eye level to make reading easier.



A Holding the thermometer.
B Rotating the thermometer.
C Reading the Fahrenheit thermometer.
D Same temperature on a Celsius thermometer.

Figure 2-1. Reading a glass thermometer.

NOTE: In order to assist you with reading the patient's temperature, most thermometers have an arrow pointing to the line denoting the average normal body temperature (98.6º F or 37º C). Additional information concerning conversion between the Fahrenheit and Celsius temperature scales is presented in MD0900, Basic Mathematics.

b. **Rotate the Thermometer.** The stem of the thermometer is not perfectly round. Its flattened areas act as a magnifying glass to make the hollow shaft in the stem appear larger. (The flattened areas also keep the thermometer from rolling off a flat surface.) Using your fingertips, slowly rotate the thermometer back and forth until the mercury in the shaft is clearly visible (see figure 2-1 B). The column of mercury will appear to be silver in color and the rest (empty part) of the shaft will appear whitish. The column of mercury should be visible just above the numbers.

c. **Locate the Nearest Temperature Mark.** There are several temperature markings (lines) on a thermometer. Identify the marking that is closest to the point where the mercury in the shaft stops (where the silver meets the white).

d. **Determine the Temperature Reading.** The method you use to determine the temperature reading of the mark you selected in the previous step depends upon whether you are using a Fahrenheit thermometer or a Celsius thermometer.

(1) Fahrenheit thermometer. On a thermometer that uses the Fahrenheit temperature scale, each long mark shows a whole degree of temperature. There are four shorter lines between each pair of long lines. These shorter lines show an increase of two-tenths of a degree Fahrenheit (0.2ºF). For example, the first short mark past (to the right of) the 98ºF mark shows a temperature reading of 98.2ºF. The second mark shows a reading of 98.4º F. The third mark is 98.6ºF and the fourth is 98.8º F. The next mark is a long line and represents a reading of 99º F. In figure 2-1 C, the temperature reading is 99.4º F.

(2) Celsius thermometer. Like the Fahrenheit temperature, each long line on a thermometer using the Celsius scale denotes a whole degree of temperature. On the Celsius scale; however, there are nine shorter marks between each pair of long marks. Each small mark shows an increase of one-tenth of a degree Celsius (0.1º C). For example, the third short mark past the 38º C line denotes a temperature reading of 38.3ºC. Figure 2-1 D shows the same temperature as figure 2-1 C using a Celsius scale thermometer. The Celsius reading is 37.4º C.

2-9. WILL A TEMPERATURE GO DOWN BEFORE IT IS READ?

Glass thermometers are designed so that the temperature reading will not go down (decrease) when the thermometer is removed from the patient. The temperature reading will remain unchanged unless the bulb end of the thermometer comes in contact with something hotter than the temperature reading shown on the thermometer or the thermometer is shaken down. "Shaking down" is the term given to the method of forcing mercury from the stem back into the bulb.

2-10. WHY ARE GLASS THERMOMETERS SHAKEN DOWN?

If a glass thermometer is not shaken down, then the thermometer continues to keep the same temperature reading. If it were to be used again on a second patient with a lower temperature, the thermometer would still show the temperature of the first patient.

2-11. HOW DO I "SHAKE DOWN" A GLASS THERMOMETER?

a. **Stand in a Clear Area.** Stand in a clear area so that you will not hit the thermometer against anything during the shaking down process. Remember, the thermometer is glass and may shatter if it strikes anything hard like a table or bed frame.

b. **Grasp the Stem End Securely.** Grasp the end of the thermometer that is opposite the bulb end with your fingers and thumb. The stem ends in a knob (usually colored either blue or red) that helps you to hold onto the thermometer during the shaking down process.

c. **"Crack the Whip."** Shake the thermometer down using quick, sharp, downward wrist motions (figure 2-2). These quick wrist motions are sometimes called "cracking the whip." Perform several of these motions. You may have a problem getting effective "cracks" at first, but with practice you will soon be able to lower the temperature to the necessary level quickly.

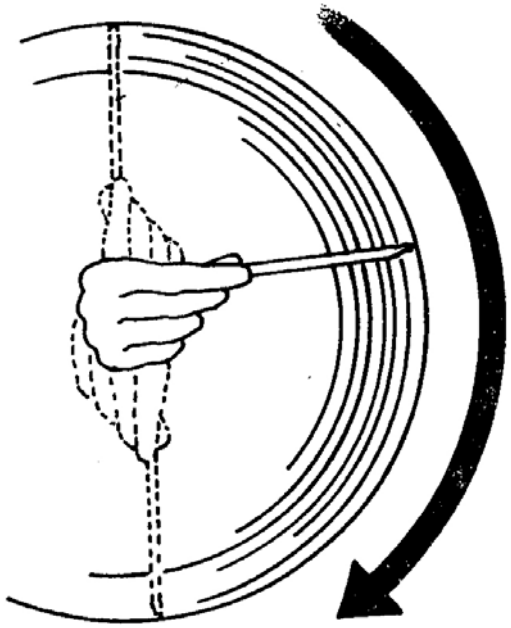


Figure 2-2. Shaking down a glass thermometer.

d. **Read the Thermometer.** After shaking down the thermometer, read the temperature shown in order to evaluate the effectiveness of your efforts.

(1) If the thermometer reading is below 94ºF (34.4º C), you have shaken down the thermometer sufficiently.

(2) If the thermometer reads 94º F (34.4º C) or above, continue to shake down the thermometer until a desired reading is shown.

2-12. HOW DOES AN ELECTRIC THERMOMETER WORK?

An electric thermometer may be battery-powered or plug into an electric outlet. The operating instructions will vary from one model to another. Therefore, you must be familiar with the operating instructions for the thermometer that you will be using. Pay special attention to the "warm up" requirements.

a. **Probe.** The electric thermometer uses a metallic sensing device called the probe. The probe is like the mercury in a glass thermometer in that the probe absorbs heat from the body tissue that surrounds it. An electric thermometer usually has two probes. The probe that is color-coded blue is used to take oral temperatures. The probe that is color-coded red is used to take rectal temperatures. Both probes are usually the same shape and size.

b. **Probe Cover.** Just as the mercury in a glass thermometer never actually touches the patient, a probe is kept from touching the patient's body by a probe cover. The cover is usually made of paper and is discarded after one use. The probe cover gives the electric thermometer a great advantage over glass thermometers in that the electric thermometer is ready to be used again once that the used cover is disposed of and replaced by a new probe cover. A glass thermometer, on the other hand, must be cleaned and sterilized before being used again.

c. **Display.** The probe has a cord that plugs into the main body of the electric thermometer. The thermometer body displays the information obtained from the probe. An electric thermometer may have either a digital or a scale display.

(1) Digital display. If the electrical thermometer has a digital display, numerals showing the patient's temperature will be shown on the screen. The electric thermometer in figure 2-3 has a digital display.

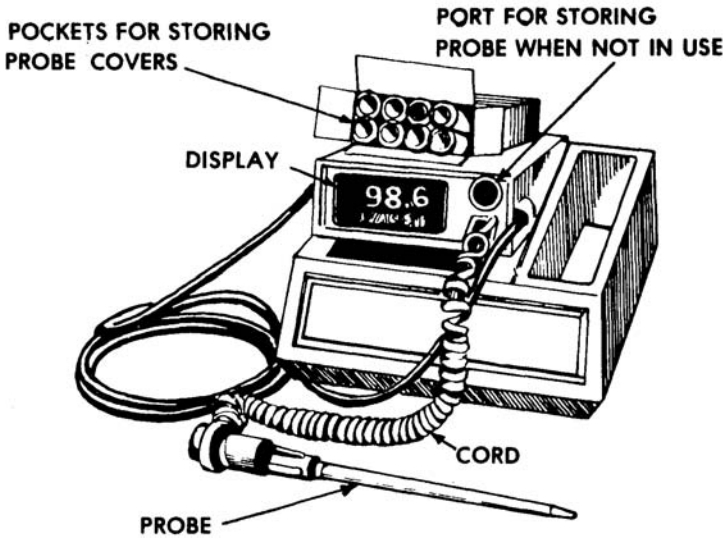


Figure 2-3. An electric thermometer.

(2) Numerical scale display. A numerical scale display looks much like the temperature scale of a glass thermometer. A permanent temperature scale is displayed and the patient's temperature is represented by a line. The longer the line is, the higher the temperature reading.

2-13. HOW DO I READ AN ELECTRIC THERMOMETER?

a. **Digital Display.** On a digital display, the patient's temperature that is shown is already rounded off to the nearest two-tenths of a degree Fahrenheit or to the nearest one-tenth of a degree Celsius.

b. **Numerical Scale Display.** A numerical scale display is read using the same procedures as a glass thermometer. Since you want your reading to be to the nearest two-tenths of a degree Fahrenheit or to the nearest one-tenth of a degree Celsius, you first determine which scale to use. Then find the mark on that scale that is nearest the end of the displayed line. Once the mark had been identified, determine the temperature represented by that mark on the scale.

Section III. TAKING TEMPERATURES

2-14. WHAT PARTS OF THE BODY ARE USED IN DETERMINING TEMPERATURE?

There are three principal locations for taking the patient's temperature (figure 2-4).

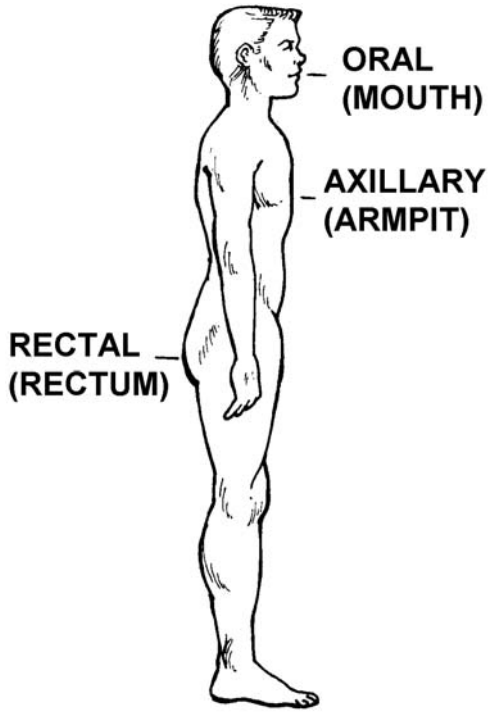


Figure 2-4. Three locations for taking temperatures.

a. **Mouth.** A temperature taken by placing a thermometer in the patient's mouth is called an oral temperature. Most of the temperatures taken in a medical facility are oral temperatures. A thermometer designed for taking an oral temperature is called an oral thermometer.

b. **Armpit.** A temperature taken by placing a thermometer under the patient's arm in his armpit area is called an axillary temperature. A thermometer designed for taking oral temperatures is also used to take axillary temperatures.

c. **Rectum.** A temperature taken by holding a thermometer within the patient's rectum is called a rectal temperature. A thermometer designed for taking a rectal temperature is called a rectal thermometer.

2-15. WHAT IS THE DIFFERENCE BETWEEN AN ORAL THERMOMETER AND A RECTAL THERMOMETER?

a. **Glass Oral Thermometers.**

(1) The bulb of an oral thermometer is either long tipped, pear-shaped, or stubby (figure 2-5 A). A long and slender bulb exposes as much surface area of the mercury as possible. Having more surface area exposed helps obtain an accurate temperature quickly.

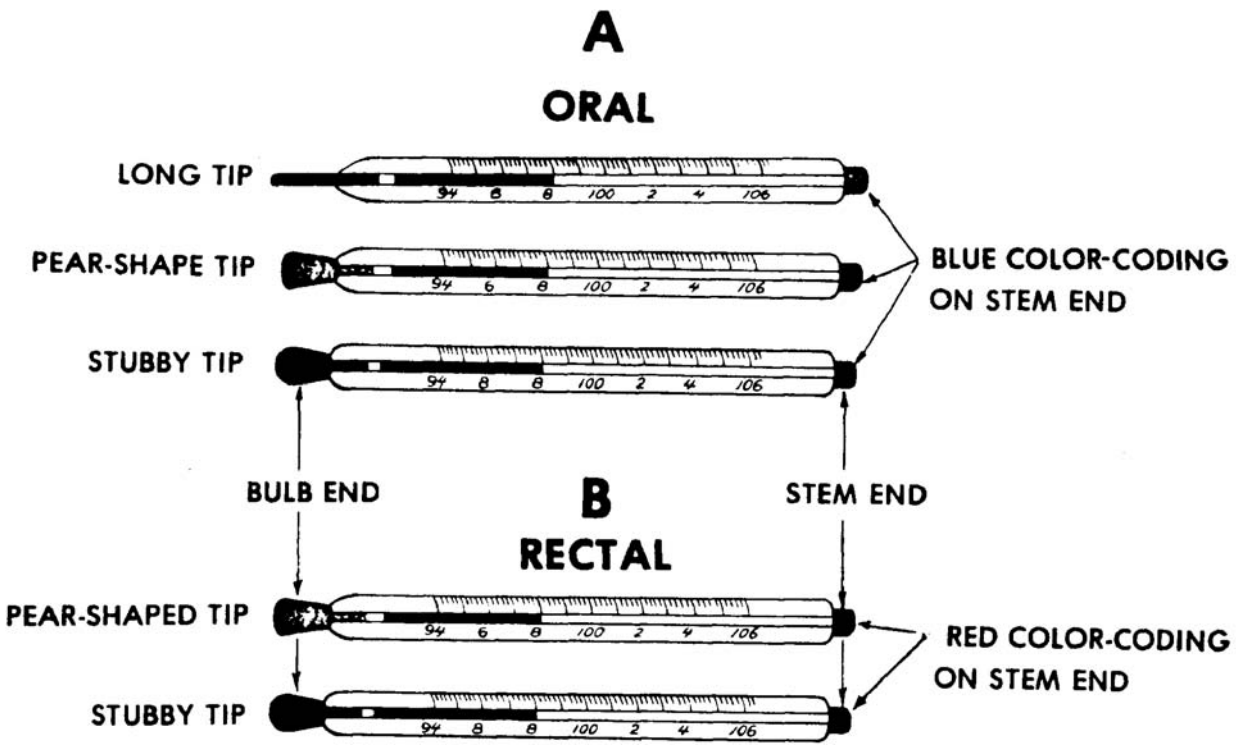


Figure 2-5. Oral and rectal glass thermometers.

(2) The other (stem) end of the oral thermometer is colored blue. Color-coding thermometers lets you tell an oral thermometer from a rectal thermometer quickly.

b. **Glass Rectal Thermometers.**

(1) The bulb of a rectal thermometer is short and thick in order to protect the rectum (figure 2-5 B). A long, slender bulb tip could accidentally injure the patient by penetrating the walls of the rectum. A blunt tipped thermometer is much less likely to damage the rectum. Remember, a thermometer with a long and slender bulb is definitely an oral thermometer while a thermometer with a short and thick bulb could be either an oral thermometer or a rectal thermometer.

(2) The stem end of a rectal thermometer is color-coded red. (Remember, the two R's--red and rectal--go together.)

c. **Electric Thermometer Probes.** Electric thermometers come with two different sensing devices (probes). One probe is designated as an oral probe while the other is designated as a rectal probe. The oral probe is color-coded blue while the rectal probe is color coded red. The oral probe and the rectal probe have the same shape and size. The color-coding is simply to prevent a probe from being used to take a temperature rectally one time and a temperature orally the next.

2-16. WILL I GET THE SAME TEMPERATURE READINGS FOR ORAL, AXILLARY, AND RECTAL TEMPERATURES?

As indicated in paragraph 2-3i, the location where the temperature is taken causes a slight difference in a patient's temperature reading. Suppose you were to measure a patient's oral, axillary, and rectal temperature at the same time. The axillary temperature reading would be about 1º F (0º.6 C) lower than the oral temperature reading while the rectal temperature reading would be about 1 ºF (0.6º C) higher than the oral temperature reading (figure 2-6).

NOTE: This example is given in order to illustrate a point. You do not take a patient's temperature three different ways at the same time.

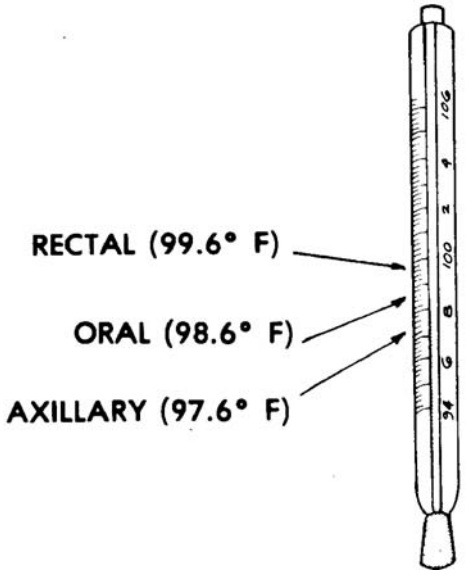


Figure 2-6. Normal average rectal, oral, and axillary temperature readings (approximate).

2-17. WHEN SHOULD I TAKE AN ORAL TEMPERATURE?

a. **When an Oral Temperature Should Be Taken.** When you are told to take a patient's temperature (either through spoken orders or through written orders), you will normally take the patient's oral temperature. Take the patient's temperature by the oral route if the following are met.

(1) The physician or nurse did not order that the temperature was to be taken by another method (that is, did not specify rectal temperature or axillary temperature).

(2) The patient is conscious and can follow directions, especially the direction "don't bite down."

(a) If a patient "bites down" on a glass thermometer, he could break the thermometer. A broken glass thermometer could cut the patient's mouth and lips. In addition, he could swallow broken glass and mercury.

(b) If a patient "bites down" on an electric thermometer probe, he could damage the probe, and he could be injured by the damaged probe.

(3) Make sure the patient can breath through his nose. (The patient must be able to breathe through his nose, since he must keep his mouth closed while the oral temperature is being taken.)

(4) There is no condition present to which make it undesirable to take the patient's temperature orally (see paragraph b).

b. **When an Oral Temperature Should Not Be Taken.** There are conditions, which indicate when an oral temperature should not be taken. (Conditions which indicate that a certain procedure or treatment should not be performed are called contraindications.) Do not measure the patient's temperature orally if one or more of the following contraindications are present.

(1) The patient has recently had facial or oral surgery. (The patient may not be able to adequately control his bite.)

(2) The patient is a child under 5 years of age. (An infant or very young child should not be expected to follow a "don't bite down" order.)

(3) The patient is confused, disturbed, heavily sedated, or has some condition (coughing, shaking chills, etc.) that makes it likely he might bite down on the thermometer.

(4) The patient is being administered oxygen by mouth or by nose.

(5) The patient has smoked, eaten hot or cold food, drank hot or cold beverage, or chewed gum within the last 30 minutes. (Hot smoke, hot foods, hot drinks, and vigorous chewing will probably result in an oral temperature reading that is higher than the actual oral temperature. Cold foods and cold drinks will probably cause the oral temperature reading to be lower than the actual oral temperature.)

2-18. HOW DO I TAKE AN ORAL TEMPERATURE WITH A GLASS THERMOMETER?

Use the following procedures when taking a patient's oral temperature.

a. **Wash Hands.** Perform a patient care hand wash.

b. **Gather Materials.** You will need to assemble the following items:

(1) Glass oral thermometer(s). You will normally obtain a tray of clean (unused) thermometers, especially if you are going to take more than one patient's temperature. Figure 2-7 shows a typical tray. (The term "tray" is used to mean all equipment and supplies carried in the tray as well as the actual tray.) The tray shown consists of a rectangular metal tray (8 inches long, 5 inches wide, and 2 inches deep), a metal container labeled "clean" holding several unused oral thermometers, and a metal container labeled "used" filled two-thirds full with water. Sometimes, the second container is labeled "dirty" instead of "used."

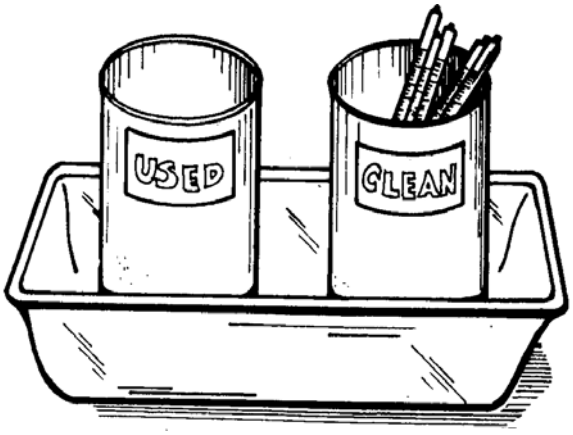


Figure 2-7. A thermometer tray.

(2) Gauze pads. You will need at least one gauze pad, usually the 2-inch by 2-inch size, for each oral temperature to be taken.

(3) Time piece. You will need a watch or clock to measure the time that the patient has had the thermometer in his mouth. A clock or watch with a second hand is preferred since a second hand is needed when measuring the patient's pulse and breathing rates.

(4) Writing materials. You will need a pencil or pen and something on which to write the patient's temperature reading. A note pad or a sheet of paper is usually sufficient. If you are to write the patient's temperature on a form, you will be told what from to use. Forms used in recording vital signs are discussed in detail in Lesson 6.

c. **Verify That the Oral Route Should Be Used.** Verify that none of these contraindications given in paragraph 2-18b exists before taking the patient's temperature.

(1) Check patient's chart. Make sure that there is no order to take the patient's temperature using the rectal or axillary route.

(2) Observe patient. Some information can be obtained by observing the patient as you approach him. For example, if you see that the patient is coughing constantly, you know that another method of obtaining the patient's temperature should be used. Awaken any sleeping patient.

(3) Ask patient questions concerning contraindications. Ask the patient if he has smoked, eaten hot or cold foods, drank hot or cold fluid, or chewed gum within the last half-hour. If the patient has done any of these things within the last half-hour, then you must decide whether to wait and take his oral temperature later or take his temperature now using a different procedure (usually the rectal method).

d. **Verify Patient's Identity.** When you are assigned to take a certain patient's temperature, make sure that the patient is the one you want. If the patient is wearing an identification bracelet, check the name on the band against the name on your form. You may also check his bed card and ask him his name. If you verify the patient's identity orally, you should ask, "What is your name, please?" rather than asking, "Are you Mr. Smith?" A mentally confused patient may answer, "Yes," to the second question without even understanding the question. In the field, check the name on the patient's identification tag (dog tag) or the name on his uniform.

e. **Examine Thermometer.** Make sure that the thermometer you are going to use is actually an oral thermometer and that the thermometer has been shaken down.

(1) Pick up thermometer. Pick up one of the thermometers from the container marked "clean." Only touch the stem end of the thermometer. If you touch a part of the thermometer that will enter the patient's mouth, the thermometer is contaminated. Place any contaminated thermometer in the "used" thermometer container and pick up another thermometer from the "clean" thermometer container.

(2) Check type of thermometer. Look at the thermometer to make sure that it is an oral thermometer. The stem end of the thermometer should be colored blue. If you have a rectal thermometer tray, return it and obtain an oral thermometer tray.

(3) Check temperature. Read the temperature shown on the thermometer. If the temperature reading is 94° F or higher, shake down the thermometer until the reading is below 94° F. When shaking down the thermometer, be sure to not touch the part of the thermometer that will go into the patient's mouth. Also, be careful to keep the thermometer from coming into contact with other objects.

f. **Tell Patient About The Procedure.** Tell the patient that you are going to take his temperature. Tell the patient what you need him to do it a courteous, but efficient, manner. Being pleasant to the patient will help to enlist his cooperation (which will make your job easier) and help the patient to relax.

g. **Position Thermometer.**

(1) Ask the patient to open his mouth. If the patient's tongue is not raised so that you can insert the thermometer under the tongue, give the patient further instructions to lift his tongue.

(2) Place the bulb on a heat pocket. The mouth has two "heat pockets" located on the bottom (floor) of the mouth at the base of the tongue (figure 2-8). One heat pocket is location on the right side of the tongue's base while the other heat pocket is located on the left side. The heat pockets are in line with the molars (teeth used for chewing). Place the thermometer so that the bulb is on top of one heat pocket with the stem near the front of the mouth on the opposite side of the mouth (figure 2-9). Crossing the center line of the mouth will help keep the thermometer in place.

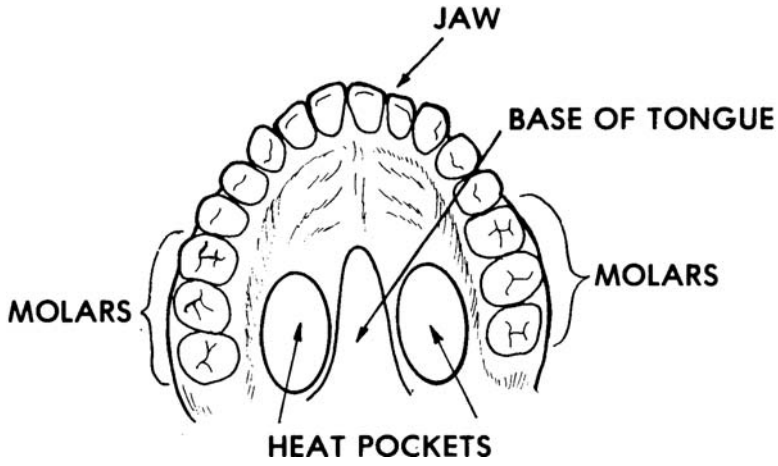


Figure 2-8. Location of heat pockets in mouth.

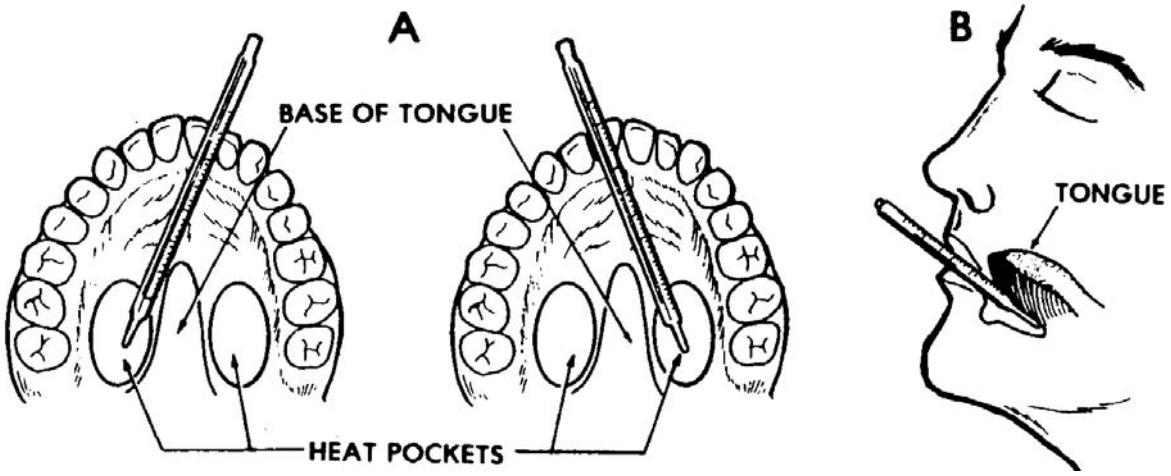


Figure 2-9. Positioning an oral thermometer.

(3) Secure the thermometer. Once the thermometer is in place, tell the patient to relax his tongue (thus covering the bulb of the thermometer) and to close his lips firmly over the thermometer. Be sure to tell the patient to not bite down on the thermometer. (If the patient bites down on the thermometer with his teeth, he may break the thermometer.) Once the patient has closed his lips over the thermometer, remove your fingers from the thermometer. If the thermometer slips or droops, you may need to position the thermometer again.

h. **Wait At Least Three Minutes.** If the thermometer has been placed properly under the patient's tongue, three minutes will be sufficient time to obtain an accurate reading. Leaving the thermometer in place more than three minutes will not interfere with the accuracy of the temperature reading. You can use the three minutes to measure the patient's pulse rate and breathing rate if you wish. If you are taking the oral temperatures of a group of patients, you may wish to begin taking the temperatures of other patients while you are waiting for the first patient's temperature reading.

i. **Remove Thermometer.** After the three-minute waiting period has passed, remove the thermometer from the patient's mouth.

(1) Grasp the stem end of the thermometer firmly with your thumb and fingers.

(2) Tell the patient to open his mouth.

(3) Remove the thermometer from the patient's mouth.

j. **Wipe Thermometer.** Pick up one of the dry 2 X 2 gauze pads and wipe the patient's saliva from the thermometer with one quick downward wipe (figure 2-10). Begin at a point above the area that was in contact with the patient's lips and wipe downward to the bulb end. The bulb itself does not need to be wiped. Discard the used gauze pad into a waste container.

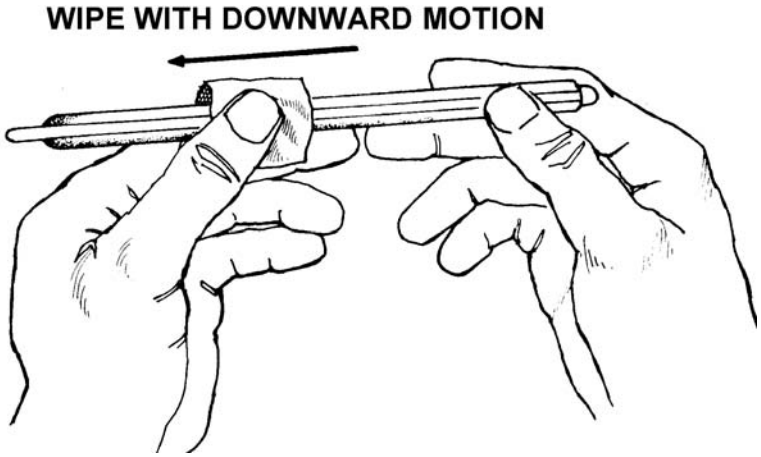


Figure 2-10. Wiping a glass thermometer.

k. **Read Thermometer.** Hold the thermometer at eye level and read the thermometer to the nearest 0.2 F° (or to the nearest 0.1° C, as applicable).

NOTE: If the patient's temperature reading is unexpectedly low, you may wish to replace the thermometer in the patient's mouth for a minute or so in order to verify the temperature. A low reading may result from the patient not keeping the bulb of the thermometer securely in place over the heat pocket.

l. **Record Patient's Temperature Reading.** Write the patient's temperature reading on the paper or form. If the patient's name is not already on the paper or form, be sure to write his name next to his temperature reading.

m. **Place Thermometer in "Used" Container.** Once you have read and recorded the patient's oral temperature, place the thermometer into the thermometer container marked "used." The thermometers in this container will be prepared for reuse later.

n. **Wash Hands.** Perform another patient care hand wash after you have finished taking the patient's (or patients') temperature(s).

o. **Turn in Tray.** After you have completed taking the temperatures, turn in the thermometer tray in accordance with procedures given in the local standing operating procedures (SOP).

2-19. HOW DO I TAKE AN ORAL TEMPERATURE WITH AN ELECTRIC THERMOMETER?

Be sure that you know how to operate the electric thermometer before using it to take a patient's temperature. Information on how to operate the electric thermometer can usually be found in an operator's manual kept on the unit or found in the unit's SOP. Different types of electric thermometers have different operating procedures. The steps given below are general in nature. Before using an unfamiliar electric thermometer, be sure to read the instructions pertaining to that thermometer.

a. **Wash Hands.** Perform a patient care hand wash.

b. **Gather Materials.** You will need the following items:

(1) Electric thermometer with oral (blue) color-coded temperature probe.

(2) Probe covers (usually found with electric thermometer).

(3) Watch or clock (with second hand, if possible).

(4) Pencil or pen.

(5) Something on which to write (usually a form or sheet of paper).

(6) An electrical outlet, unless the electric thermometer is battery-powered.

c. **Verify That the Oral Route Should Be Used.** Any situation that would prevent you from taking a patient's oral temperature with a glass thermometer will also prevent you from taking his oral temperature with an electric thermometer.

d. **Verify Patient's Identity.** Make sure that you are taking the temperature of the patient properly by checking the patient's identification bracelet and bed card and/or asking the patient his name.

e. **Prepare Thermometer.** Make sure that the electric thermometer is working and ready to use. Several electric thermometers indicate that they are ready for use by displaying an initial temperature reading, such as displaying a reading of 94.0^{o} F, when the probe is removed from its resting place. If such a thermometer does not show a display, check the electrical outlet or batteries, as applicable.

f. **Cover Probe.** Insert the oral probe into a probe cover. The exact procedure used will depend upon the operating instructions for the thermometer you are using. Normally, you will insert to probe into a box containing probe covers. The innermost cover will automatically attach to the probe. You should not allow the probe cover to touch anything before the probe is inserted into the patient's mouth.

g. **Tell Patient About Procedure.** Tell the patient that you are going to take his temperature and give additional instructions as needed.

h. **Position the Probe.** Place the heat sensing part of the probe so that it is lying on top of one of the heat pockets. The procedures are basically the same as for taking an oral temperature with a glass thermometer.

(1) Tell the patient to open his mouth and lift his tongue.

(2) Place the end of the probe over one of the heat pocket.

(3) Tell the patient to relax his tongue and close his lips (not his teeth) over the probe.

(4) Do not let go of the probe. Keep holding the probe in place with your thumb and finger(s).

i. **Wait for Signal.** Continue holding the probe in place in the patient's mouth until the electric thermometer gives the signal that the patient's temperature has been determined.

(1) Hold the probe so that it is steady (not moving) and is in constant contact with the tissue of the heat pocket.

(2) The signal that the patient's temperature has been determined is usually a red light that lights upon the main body of the electric thermometer.

(3) The time required for the temperature to be determined depends upon the thermometer, but is usually less than 60 seconds.

j. **Remove Probe.** When the machine signals that the patient's temperature has been determined, ask the patient to open his mouth. When the patient releases his hold upon the probe, remove the probe from his mouth.

k. **Read and Record Temperature.** Read the patient's temperature from the display on the main body of the thermometer and record the reading. If the display is not a digital readout, record the temperature to the nearest two-tenths of a degree Fahrenheit (0.2º F) or to the nearest tenth of a degree Celsius (0.1º C), as appropriate.

l. **Discard Probe Cover.** The probe cover is used only once. After you have recorded the temperature, discard the cover into a container (patient's waste basket, etc.). Some electric thermometer are designed so that the probe cover is ejected from the probe when you hold the probe collar between your index and middle fingers, point the probe downward, and press on top of the probe with your thumb.

m. **Return Probe to Its Resting Place.** In some electric thermometers, returning the probe to its resting place automatically turns off the thermometer and resets the thermometer so that it is ready for the next use.

h. **Wash Hands.** Perform another patient care hand wash.

2-20. WHEN SHOULD I TAKE A RECTAL TEMPERATURE?

a. **When a Rectal Temperature Should Be Taken.** A rectal temperature should be taken if one of the two following situations exists.

(1) The physician or nurse has ordered that a rectal temperature be taken. (A rectal temperature may be ordered because it is more accurate measurement of a patient's body temperature than are oral and axillary temperature readings.)

(2) The temperature route (oral, rectal, or axillary) has not been specified, conditions exist which contraindicate the oral route (paragraph 2-17b), and no conditions exist that contraindicate taking a rectal temperature (paragraph "b" below). The rectal procedure is normally used for an infant or young child, for a patient who is unconscious or irrational, and for a patient that has difficulty breathing with his mouth closed. The rectal route is used in the case of any suspected environmental injury such as heatstroke or hypothermia.

b. **When a Rectal Temperature Should <u>Not</u> Be Taken.** Do not take a patient's rectal temperature if one or more of the following conditions (contraindications) are present.

(1) The patient has a heart (cardiac) condition. (The thermometer or probe could stimulate the vagus nerve in the rectum and cause cardiac arrhythmia.)

(2) The patient has hemorrhoids. (A hemorrhoid is enlarged portion of a vein. If the thermometer or probe were to damage a hemorrhoid, pain and bleeding could result.)

(3) The patient has recently under gone rectal surgery.

(4) The patient has diarrhea.

2-21. HOW DO I TAKE A RECTAL TEMPERATURE WITH A GLASS THERMOMETER?

Use the following procedures when taking a patient's rectal temperature.

a. **Wash Hands.** Perform a patient care hand wash.

b. **Gather Materials.** You will need to assemble the following items:

(1) Glass rectal thermometer(s). Rectal thermometers will normally be in a tray such as was shown in figure 2-7. The difference between on oral thermometer tray and a rectal thermometer tray is in the type of thermometers in the "clean" container.

(2) Lubricant. You will need a water-soluble lubricant. A lubricated thermometer can be inserted into the rectum much easier than a thermometer that has not been lubricated. If the lubricant is in a jar, you will need a tongue depressor or other instrument to transfer the lubricant from the jar to the gauze pad.

(3) Gauze pads. The gauze pads are used to lubricate the thermometer and to wipe the thermometer after you remove it from the patient's rectum.

(4) Timepiece. A watch or clock with a second hand is preferred.

(5) Writing materials. You will need a pencil or pen and something on which to write (form, note pad, etc.).

c. **Verify That The Rectal Route Should Be Used.** A rectal temperature should be taken when one of the following conditions exist:

(1) The physician or nurse has ordered a rectal temperature and the patient's condition does not contraindicate taking a rectal temperature.

(2) The physician or nurse has not stated the method to be used, the oral method is contraindicated (paragraph 2-17b), and the rectal is not contraindicated (paragraph 2-20b).

d. **Verify Patient's Identity.** Be sure to verify that you are taking the temperature of the proper patient.

e. **Tell Patient About Procedure.** Tell the patient that you are going to take his temperature rectally. Be sure to explain how you want the patient to position himself (paragraph f) and inform him when you are going to insert and remove thermometer.

f. **Position Patient.** Have the patient to lie on his side with his top knee flexed (bent). (This is called the "Sims's" position.") Arrange the patient's clothing (gown, pajamas, etc.) and bed sheet so that the rectal area is clearly exposed, but so that the patient is not exposed unnecessarily.

g. **Prepare Lubricant.** Before the rectal thermometer is inserted, the bulb of the thermometer must first be lubricated. Your SOP will indicate what type of lubricant is to be used (usually a type of jelly or mineral oil). Prepare the lubricant by placing some of the lubricant on a gauze pad. If the lubricant is in a jar, a tongue depressor can be used to transfer some of the lubricant from the jar to the pad. A thermometer should not be dipped into a jar of lubricant since this action could contaminate the lubricant remaining in the jar.

h. **Examine Thermometer.** Pick up a thermometer from the "clean" container. Be sure to avoid touching the part of the thermometer that will be inserted into the patient's rectum. Make sure that the thermometer is a rectal thermometer (red color-coded and not long-tipped) and that its temperature reading is below 94º F.

(1) If the thermometer is not a rectal thermometer, obtain a rectal thermometer.

(2) If the thermometer reads 94º F or higher, shake the thermometer down until the reading is below the 94º F mark.

i. **Lubricate Thermometer.** The bulb of the thermometer is lubricated in order to make it easier to insert the thermometer into the rectum and to keep the muscles inside the rectum from being irritated by a dry rectal thermometer. (If the muscles are irritated, they may contract and try to push the thermometer out of the rectum.) Lubricate the thermometer by putting the tip of the thermometer bulb into the lubricant on the gauze (figure 2-11). Then use the gauze pad to spread the lubricant over the entire bulb of the thermometer and over two inches of the stem. After you have lubricated the thermometer, discard the gauze pad into an appropriate waste container.

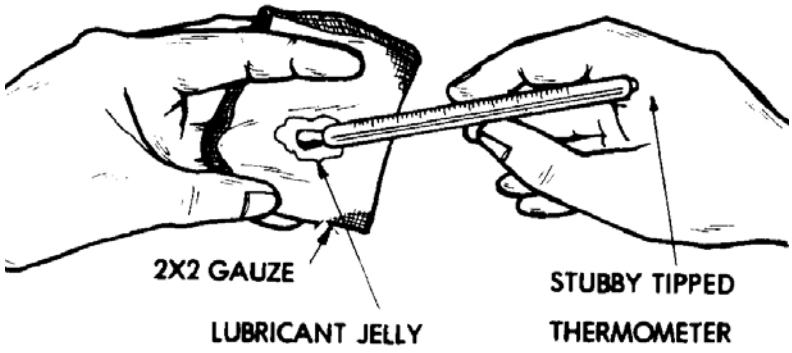


Figure 2-11. Lubricating a rectal thermometer.

j. **Insert Thermometer.** Insert the thermometer into the patient's rectum using the following steps:

(1) Tell the patient that you are going to insert the thermometer.

(2) Using your free hand (the hand that is not holding the thermometer), lift the patient's upper buttock slightly (see figure 2-12) until the anus is clearly exposed.

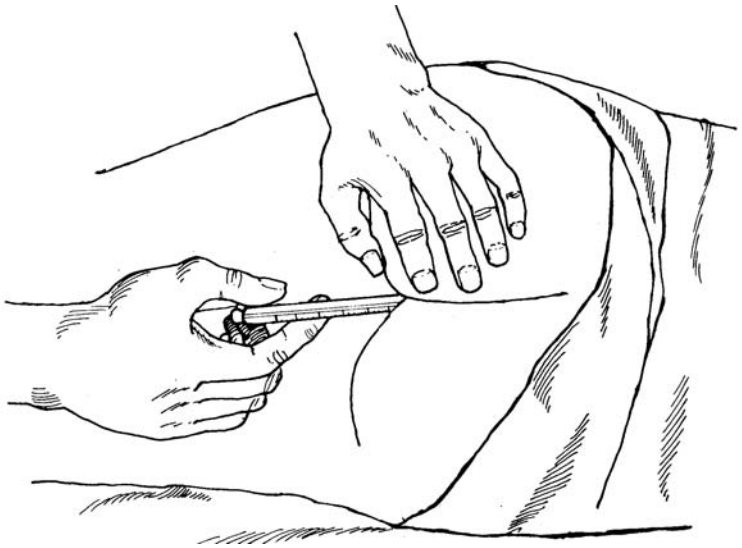


Figure 2-12. Inserting a rectal thermometer in an adult patient.

(3) Have the patient take a deep breath and then release the breath. (This will help to relax the sphincter muscle that controls the opening and closing of the anus.)

(4) Insert the lubricated bulb of the thermometer through the anus opening.

(5) Continue to gently insert the thermometer until one to two inches of the thermometer has been inserted.

(6) Release your hold on the patient's upper buttock, but do not let go of the thermometer.

NOTE: If the patient is an infant, expose the rectal area by laying the infant on his back and lifting both legs into the air (figure 2-13). Insert the lubricated thermometer until 1/2 to 3/4 inches has been inserted.

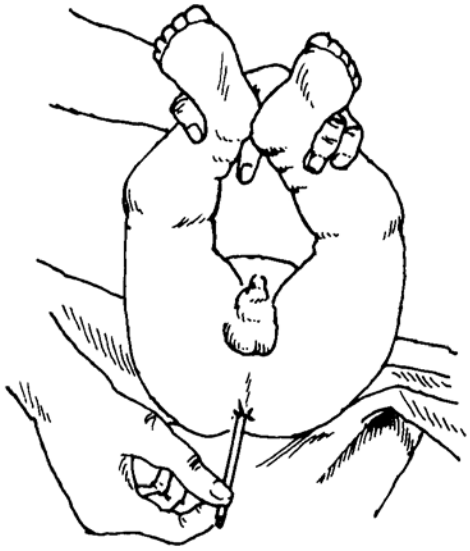


Figure 2-13. Inserting a rectal thermometer in an infant.

k. **Hold Thermometer in Place for Two Minutes.** An accurate temperature reading can be obtained within two minutes. You must hold the thermometer in place during this time in order to prevent the thermometer from being expelled (pushed out) of the rectum and to prevent the thermometer from entering further into the rectum.

l. **Remove Thermometer.** After at least two minutes have elapsed, remove the thermometer from the patient's rectum.

(1) Tell the patient that you are going to remove the thermometer.

(2) Using your free hand, lift the upper buttock again.

(3) Gently pull the thermometer from the patient's rectum.

(4) Release the upper buttock.

(5) Cover the patient's rectal area (reposition gown, pajamas, bed sheet, and so forth).

m. **Wipe Thermometer.** Use a gauze pad to wipe the thermometer. Begin near the hand that is holding the thermometer and wipe to the bulb in one quick, downward stroke. Discard the used gauze pad into a waste container.

n. **Read Thermometer.** Hold the thermometer at eye level and read the temperature to the nearest 0.2 ºF (or 0.1º C).

o. **Record Reading.** Write the patient's temperature reading on the form or piece of paper. After you record the temperature reading, write a circled "R"(®)above the reading. The ® indicates that the temperature is a rectal temperature rather than an oral temperature.

p. **Place Thermometer in "Used" Container.** After recording the patient's rectal temperature, place the used thermometer into the container marked "used" on the thermometer tray.

q. **Wash Hands.** Perform a patient care hand wash after taking a rectal temperature.

r. **Turn in Tray.** After you have completed taking rectal temperatures, turn in the temperature tray according to local procedures. The thermometers must be decontaminated before they are used again.

2-22. HOW DO I TAKE A RECTAL TEMPERATURE WITH AN ELECTRIC THERMOMETER?

If you are not familiar with the electric thermometer you will be using, read the instructions provided in the operator's manual or in your SOP before using the thermometer to take a patient's temperature. The general procedures for taking a patient's temperature with an electric thermometer are given below.

a. **Wash Hands.** Perform a patient care hand wash before beginning the procedure.

b. **Gather Materials.** You will need the following items:

(1) Electric thermometer with rectal (red) temperature probe.

(2) Probe covers (usually found with electric thermometer).

(3) Lubricant (usually a jelly or mineral oil), and if needed, an instrument (such as a tongue depressor) to transfer the lubricant from the container to the gauze pad.

(4) Gauze pad.

(5) Watch or clock (with second-hand, if possible).

(6) Pen or pencil.

(7) Something on which to write (form, note pad, and so forth).

(8) Electrical outlet, unless the thermometer is battery-powered.

c. **Verify That The Rectal Route Should Be Used.** Any situation that will prevent you from taking the patient's rectal temperature with a glass thermometer will also prevent you from taking his rectal temperature with an electric thermometer.

d. **Verify Patient's Identity.** Make sure that you are taking the temperature of the proper patient.

e. **Prepare Thermometer.** Make sure that the electric thermometer is working and ready to use.

f. **Tell the Patient About Procedure.** Tell the patient that you are going to take his temperature rectally. Explain to the patient how he is to position himself (paragraph g). Inform him before inserting or removing the probe.

g. **Position Patient.** Have the patient to lie on his side with his top knee flexed in the Sims's position. Arrange the patient's clothing and bed sheet so that the rectal area is clearly exposed, but the patient is not unnecessarily exposed.

h. **Prepare Lubricant.** Place some of the lubricant onto a gauze pad. If the lubricant must be transferred from a jar or similar container, use a tongue depressor or similar instrument to put the lubricant onto the pad.

i. **Cover Probe.** Insert the rectal probe into a probe cover.

j. **Lubricate Probe Cover.** Put the tip of the probe into the lubricant. Then use the gauze pad to spread lubricant over the lower part of the probe cover. Dispose of the gauze pad after the probe cover is lubricated.

k. **Insert Probe.** Insert the probe into the patient's rectum using the following steps:

(1) Tell the patient that you are going to insert the thermometer probe.

(2) Using your free hand, lift the patient's upper buttock slightly, so that the anus is clearly exposed.

(3) Have the patient take a deep breath and then release the breath.

(4) Insert the lubricated tip of the probe through the anus opening.

(5) Continue to gently insert the probe until one to two inches of the probe has been inserted.

(6) If the thermometer will take several seconds to register the patient's temperature, release your hold on the patient's buttock. If the thermometer will register the temperature in only a few seconds, you may wish to keep the buttock raised rather than raising it again to remove the probe. In either case, do not let go of the temperature probe.

l. **Wait for Signal.** Hold the temperature probe in place until the thermometer signals (red light, etc.) that the patient's temperature has been determined.

m. **Remove Probe.** If you have released the patient's upper buttock, raise the buttock again. Then carefully remove the probe from the patient's rectum. After the probe has been removed, release the patient's buttock and cover the patient again (reposition gown, pajamas, bed sheet, and so forth).

n. **Read and Record Temperature.** Read the patient's temperature from the display and record the reading. If the electric thermometer does not display the temperature rounded to the nearest 0.2º F or 0.1º C, round off the patient's temperature to this degree of accuracy. Write " Ⓡ " above reading to indicate that the temperature is a rectal temperature.

o. **Discard Probe Cover.** Eject the probe cover into a waste container.

p. **Return Probe to Resting Place.** Return the probe to its resting place. If additional actions are required to reset the temperature display to be used again, perform those actions.

q. **Wash Hands.** Perform another patient care hand wash.

2-23. WHEN SHOULD I TAKE AN AXILLARY TEMPERATURE?

You will take a patient's axillary temperature if the physician or nurse orders the patient's temperature to be taken in that manner. You will also take the axillary temperature when both an oral temperature and a rectal temperature are contraindicated. An axillary temperature is less accurate than either a rectal temperature or an oral temperature; therefore, you must use extra care when taking an axillary temperature to ensure as accurate a measurement as possible.

2-24. HOW TO TAKE AN AXILLARY TEMPERATURE?

An axillary temperature is taken with an oral thermometer, not a rectal thermometer. Normally, axillary temperature is taken with a glass thermometer rather than an electric thermometer. Use the following procedures to take a patient's axillary temperature with a glass thermometer.

a. **Wash Hands.** Perform a patient care hand wash.

b. **Gather Materials.** You will need the following:

(1) Thermometer tray with oral glass thermometers. (Use pear-shaped tip or stubby tip thermometers only since the long tip bulb could injure the patient's skin.)

(2) Gauze pads.

(3) Watch or clock (preferably with a second hand).

(4) Pencil or pen.

(5) Form, note pad, or other writing material.

c. **Verify That the Axillary Route Should Be Used.** You should take the patient's temperature using the axillary (under arm) route if either of the following situations applies.

(1) The physician or nurse orders that the temperature be taken using the axillary route.

(2) Both the oral and rectal routes are contraindicated (paragraphs 2-17b and 2-20b).

d. **Verify the Patient's Identity.** Make sure that you are taking the temperature of the proper patient.

e. **Position Patient.** Tell the patient that you are going to take his temperature. Help the patient arrange his clothing so that his axillary area is fully exposed (remove one arm from pajama tops or from gown, and so forth). When practical, have the patient lie on his back. (Having the patient lie on his back will greatly reduce the danger of the thermometer dropping onto the floor.)

f. **Examine Thermometer.** Pick up one of the thermometers from the "clean" container on the thermometer tray. Make sure that it is a pear-shaped or stubby-tipped oral thermometer. Read the thermometer. Shake down the thermometer before using, if the reading on the thermometer is 94.0º F or above,

g. **Position Thermometer.**

(1) Have the patient raise his arm so that the underarm area is fully exposed. You may need to assist the patient by supporting his arm.

(2) Pat the patient's underarm with gauze pads in order to dry the area. Excessive moisture will cool the skin and could result in an inaccurate temperature reading. Be sure to pat the area dry rather than rubbing the area. Rubbing the axillary area could cause an inaccurate reading due to the heat caused by friction (rubbing).

(3) Place the bulb of the thermometer in the center of the axilla. Angle the thermometer so that the stem is pointed up and in the direction of the patient's head (figure 2-14).

(4) Have the patient bring his arm down so that his upper arm is against the side of his chest and his forearm and hand lie across the top of his chest (figure 2-15). Having the upper arm against the side of the chest forces the air out of the axillary area. Air in the axillary area can cool the area and result in a lower temperature reading. The arm position also secures the thermometer and keeps the bulb in the center of the axilla.

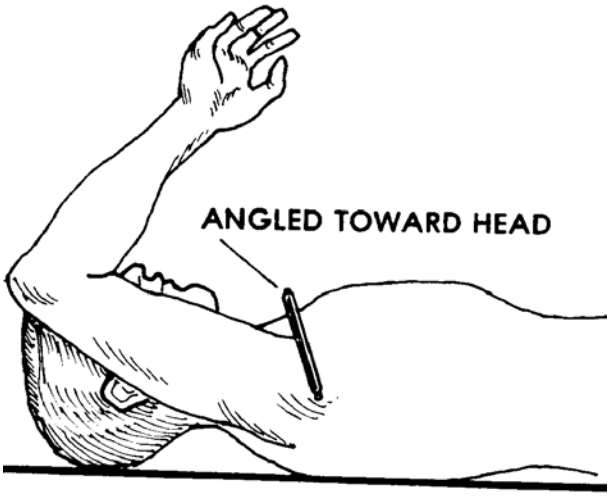


Figure 2-14. Positioning a thermometer to take an axillary temperature.

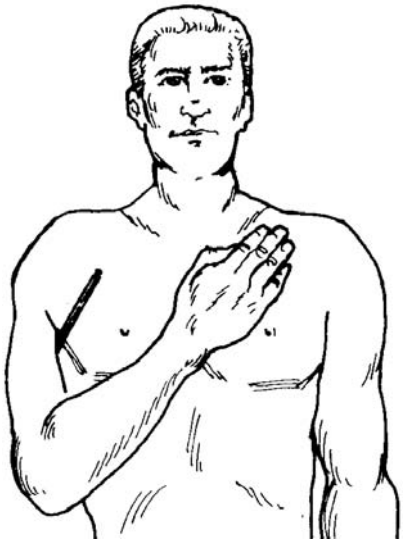


Figure 2-15. Patient with thermometer secured in axillary.

h. **Wait Ten Minutes.** Leave the thermometer in place for at least ten minutes in order to obtain an accurate temperature reading. If the patient is capable of keeping the thermometer in place without your assistance, you may use this time to do other tasks such as taking his pulse and breathing rates.

i. **Remove Thermometer**.

(1) Tell the patient that you are going to remove the thermometer. As you talk to the patient, grasp the stem end of the thermometer with thumb and fingers of one hand. (Grasping the thermometer keeps the thermometer from falling if he moves his arm before you are ready.)

(2) Use your free hand to lift the patient's elbow so that his upper arm is no longer resting against his chest.

(3) Remove the thermometer from the axillary.

j. **Wipe Thermometer.** Wipe the thermometer with a gauze pad. Begin near the stem end and wipe toward the bulb with one downward motion.

k. **Read and Record Temperature.** Read the thermometer to the nearest 0.2º F (or nearest 0.1º C). Then record the temperature on the form or paper. Write a circled "A" above the temperature reading to indicate that it is axillary temperature rather than an oral temperature.

l. **Place Thermometer in "Used" Container.** Place the thermometer into the "used" container on the thermometer tray. The thermometer must be decontaminated before it can be used again.

m. **Wash Hands.** Perform another patient care hand wash.

2-25. HOW ARE GLASS THERMOMETERS DECONTAMINATED?

Glass thermometers must be cleaned and decontaminated before they can be reused. If thermometers were not decontaminated before being reused, then they could transfer disease from one patient to another patient. The procedures for cleaning and decontaminating thermometers are governed by local SOP. If thermometers are to be sterilized by the Centralized Materiel Section (CMS), an element of the Department of Nursing in the hospital, they should be washed with soap and cold-water pads before they are sent to the CMS. However, if your unit is responsible for cleaning and decontaminating the thermometers, you should follow the instruction given in your local SOP. The instructions given below are typical of such instructions.

a. **Gather Materials.** You will need the following:

(1) Thermometer tray with marked containers (one "clean" and one "used").

(2) Covered oblong basin in which thermometers can lie flat, such as a catheter tray.

(3) Disinfecting solution, such as Wescodyne®.

(4) Soapy solution or germicide, such as providone-iodine (Betadine®).

(5) Gauze pads.

(6) Paper towels.

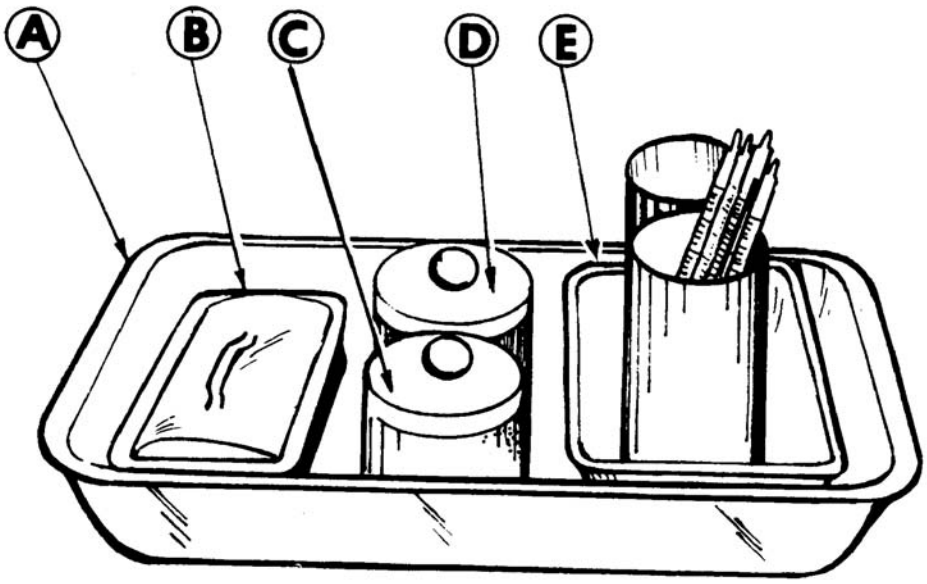
(7) Two containers for gauze pads.

(8) Tray (15" X 9" X 2") to carry the above items, if appropriate.

(9) Water source (cool and hot water).

(10) Waste container.

b. **Prepare Disinfecting Equipment.** Set up your equipment similar to the setup shown in figure 2-16.



A 15" X 9" X 2" tray.
B Covered basin containing disinfecting solution.
C Container with gauze pads soaked in soapy solution or germicide.
D Container with gauze pads soaked in cool water.
E Thermometer tray with "clean" and "used" thermometer containers.

Figure 2-16. Tray set up for disinfecting glass thermometers.

(1) Put the thermometer tray with "clean" and "used" containers and thermometers on the large tray.

(2) Pour the disinfecting solution into the basin until the basin is two-thirds full.

(a) The disinfecting solution may have to be mixed before pouring into basin. If so, follow the instructions on the label.

(b) The basin may already contain disinfecting solution. The solution may be used if it has not already been used to disinfect thermometers and if the solution has not been standing in the basin for more than 24 hours. Check your local SOP for additional information.

(3) Put gauze pads into the two containers.

(4) Pour the soapy solution or germicide into one of the containers so that all of the gauze pads in the container are soaked.

(5) Pour cool water into the other container so that all of the pads in that container are soaked.

NOTE: Containers with soaked gauze pads may already be on the tray.

c. **Clean Thermometers.** Thermometers are cleaned one at a time. All of the thermometers should be either oral thermometers or rectal thermometers. If a thermometer tray contains both oral and rectal thermometers, they must be placed in separate basins.

(1) Grasp the stem end of a thermometer and remove it from its container.

(2) Read the thermometer. If the thermometer reads 94.0º F (34.4º C) or higher, shake down the thermometer.

(3) With your free hand, pick up a gauze pad saturated with the soapy (or germicide) solution.

(4) Wrap the gauze pad around the thermometer near the stem end.

(5) Wipe the thermometer with a single downward twisting motion. Be sure to wipe the bulb since most of the contamination is in the bulb area. Do not retrace or backtrack since moving from bulb end toward stem end could contaminate the area of the thermometer that you have just wiped.

(6) Drop the gauze pad into the waste container.

(7) Pick up a gauze pad saturated with cool water.

(8) Wrap the gauze pad around the thermometer near the stem end.

(9) Wipe the thermometer with a single downward twisting motion. Do not retrace or backtrack.

(10) Drop the gauze pad into the waste container.

(11) Carefully, place the thermometer in the oblong basin. Do not drop the thermometer or splash the disinfecting solution.

(12) Repeat these procedures until all of the thermometers have been placed in the basin to soak. As you put the thermometers in the basin, place the thermometers so that the bulbs all point in the same direction.

d. **Disinfect Thermometers.** After all of the thermometers have been placed in the basin, make sure that the thermometers are completely covered by the disinfecting solution. Add additional solution if necessary. Then cover the basin and allow the thermometers to soak in the disinfecting solution for the proper amount of time. The amount of time may vary depending upon the solution used, but they must soak for at least 30 minutes. Check your local SOP for the time that the thermometers are to be left in the solution.

e. **Clean Thermometer Containers.** While the thermometers are soaking in the disinfecting solution, clean the two thermometer containers.

(1) Wipe the inside and outside of one container with the gauze pads that were soaked in the soapy (or germicide) solution.

(2) Drop the used pads into the waste container.

(3) Rinse the container with hot water.

(4) Dry the holder with a paper towel.

(5) Drop the paper towel into the waste container.

(6) Check the label on the container (the "clean" label or "used" label) to ensure that it is still in place.

(7) Put the container back in the thermometer tray.

(8) Repeat the above steps to clean the second container.

(9) Fill the container marked "used" two-thirds full with cool water.

f. **Wash Hands.** Perform a patient care hand wash.

g. **Change Disinfecting Solution.** After the required time for disinfecting the thermometers has passed, carefully pour the disinfecting solution from the basin into the sink. Then add new disinfecting solution to the basin. Make sure that the new solution covers the thermometers completely. (This new solution will remain in the basin after the thermometers are removed. The solution can be used to disinfect the next group of thermometers. If no thermometers are disinfected within 24 hours, discard the solution and make a new solution when needed.)

h. **Rinse and Replace Thermometers in Container.** Thermometers are removed from the basin, rinsed, and placed in the "clean" container one at a time.

(1) Pick up a thermometer at the stem end and lift it out of the disinfecting solution.

(2) Pick up a gauze pad that was soaked in cool water.

(3) Wipe the thermometer completely with the gauze pad. Begin at the stem end and proceed toward the bulb. Wipe the bulb thoroughly. All of the disinfecting solution must be removed because some patients are allergic to the solution.

(4) Drop the gauze pad into the waste container.

(5) Dry the thermometer (stem end to bulb) with a dry gauze pad or paper towel.

(6) Place the thermometer (bulb end down) into the container marked "clean." Make sure that oral thermometers and rectal thermometers are not placed in the same container. The thermometers are now ready for reuse.

i. **Return Materials.** Return disinfecting supplies to their proper storage place (see your SOP). Deliver the thermometer tray to the appropriate location so that it can be used (see your SOP).

Continue with Exercises

EXERCISES: LESSON 2

INSTRUCTIONS. The following exercises are to be answered by marking the lettered response that best answers the question, or best completes the incomplete statement, or by writing the answer in the space provided. After you have completed all the exercises, turn to "Solutions to Exercises" at the end of the lesson and check your answers.

1. What are two general reasons for taking a patient's temperature?

   _____

   _____

2. A person's temperature is considered to be within the "normal" temperature range if his body temperature is between _____ ºF and _____ ºF.

3. The average body temperature (measured orally) is _____.

4. The part of the brain that controls the body's heat regulating mechanisms is called the _____.

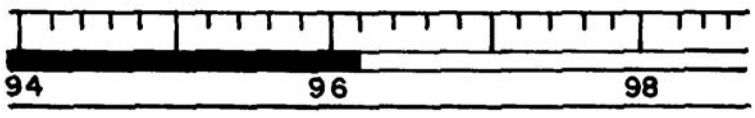
5. Which type of thermometer will measure a patient's temperature faster?

   a. Electric thermometer.

   b. Glass thermometer.

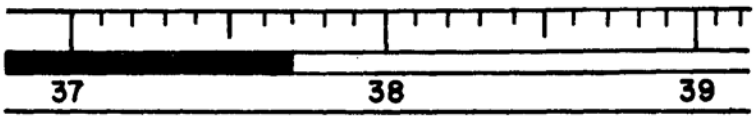
6. What is the temperature reading of the Fahrenheit thermometer shown below?

   _____



7. What is the temperature reading of the Celsius thermometer shown below?

_____



8. A glass thermometer is "shaken down" using quick motion of the:

   a. Fingertips.

   b. Wrist.

   c. Forearm.

   d. Elbow.

   e. Whole arm.

9. Shake down a glass Fahrenheit thermometer until temperature reading is below _____ .

10. If you are going to use a model of an electric thermometer that you have not used before, you should:

    a. Guess how it works.

    b. Ask the patient if he or she knows how to operate the device.

    c. Read the instructions before using the device.

11. List the three areas of the body that are normally used to measure the patient's body temperature?

    a. _____

    b. _____

    c. _____

12. The bulb of a glass thermometer is long and slender. This thermometer is used to take:

    a. Oral temperatures only.

    b. Rectal temperatures only.

    c. Axillary temperatures only.

    d. Rectal and axillary temperatures.

    e. Oral and axillary temperatures.

    f. Oral, axillary, and rectal temperatures.

13. Oral thermometers are color-coded_____ while rectal thermometers are color-coded _____.

14. A rectal temperature reading will be about _____than an oral temperature reading for the same patient.

    a. 1º F higher.

    b. 3 º F higher.

    c. 1º F lower.

    d. 3º F lower.

15. An axillary temperature reading will be about _____ than an oral temperature reading for the same patient.

    a. 1º F higher.

    b. 3º F higher.

    c. 1º F lower.

    d. 3º F lower.

16. Certain conditions or situations contraindicate taking an oral temperature. Place an "X" in the blank in front of each condition which indicates that an oral temperature should not be taken.

    a. ____ The patient is 19 years old.

    b. ____ The patient is unconscious.

    c. ____ The patient can breath through his nose.

    d. ____ The patient is mentally confused.

    e. ____ The nurse tells you that the patient's temperature is to be taken rectally.

    f. ____ The patient finished smoking a cigarette about ten minutes ago.

    g. ____ Your orders do not state how the patient's temperature is to be taken.

    h. ____ The patient has a cardiac (heart) condition.

17. You have just placed an oral glass thermometer under the patient's tongue and the patient is securing the thermometer's position with his lips. How long should you wait before reading the thermometer?

    a. At least 30 seconds.

    b. At least 1 minute.

    c. At least 3 minutes.

    d. At least 5 minutes.

    e. At least 10 minutes.

    f. At least 30 minutes.

18. Place an "X" in the blank in front of each condition which contraindicates taking a rectal temperature (that is, indicates that a rectal temperature should not be taken).

    a. ____ The patient has recently undergone oral surgery.

    b. ____ The patient has recently undergone rectal surgery.

    c. ____ The patient has hemorrhoids.

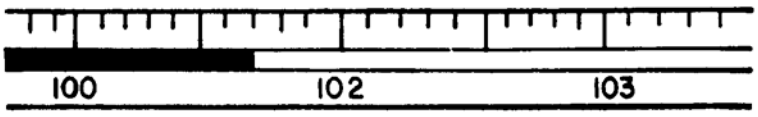
    d. ____ The patient has just finished drinking a hot cup of coffee.

    e. ____ The patient has a cardiac condition.

19. When taking the rectal temperature of an adult, the thermometer should be inserted to a depth between _____ and _____ inches and held in place for _____ minutes.

20. When taking the rectal temperature of an infant, the thermometer should be inserted to a depth of _____ and _____ inches and held in place for _____ minutes.

21. Record the rectal temperature shown below in the following blank. _____



22. Before inserting the probe of the electric thermometer into the patient's rectum, the probe cover should be:

    a. Moistened with sterile water.

    b. Lubricated with a jelly or oil.

    c. Removed from the probe.

    d. Wrapped in sterile gauze.

23. Before inserting the probe of the electric thermometer into the patient's rectum, you should have the patient:

    a. Lie on his side and flex his top knee.

    b. Lie on his side and flex his bottom knee.

    c. Stand up, then bend as far forward as possible.

    d. Lie on his back, bring both knees up to his chest, and wrap both arms around his legs in order to maintain this position.

24. When taking a patient's axillary temperature, you should leave the thermometer in place for at least _____ minutes.

25. The thermometers must soak in the disinfecting solution for a minimum of _____ minutes.

Check Your Answers on Next Page

SOLUTIONS TO EXERCISES: LESSON 2

1. To Determine the Cause of the Patient's Condition.
   To Determine the Effectiveness of Treatment. (para 2-1)

2. 96.8º F; 100.4º F (para 2-2)

3. 98.6º F (or 37º C) (para 2-2)

4. Hypothalamus (para 2-4a)

5. a (para 2-6)

6. 96.2 º F (paras 2-8c, d)

7. 37.7 º C (paras 2-8c, d)

8. b (para 2-11c)

9. 94ºF or 34.4º C (para 2-11d(1))

10. c (para 2-12)

11. Mouth
    Armpit
    Rectum (or anus) (para 2-14)

12. a (paras 2-15, 2-24b(1))

13. Oral: blue; rectal: red (paras 2-15a(2), b(2))

14. a (para 2-16)

15. c (para 2-16)

16. X b.
    X d.
    X e.
    X f. (para 2-17b)

17. c (para 2-18h)

18. X b.
X c.
X e. (para 2-20b)

19. Between 1 and 2 inches; for 2 minutes. (paras 2-21j(5), k)

20. Between 1/2 and 3/4 inches; for 2 minutes. (para 2-21j, Note, k)

21. ® ®
101.4 or 101[4] (para 2-21o)

22. b (paras 2-22b(3), j)

23. a (para 2-22g)

24. 10 (para 2-24h)

25. 30 (para 2-25d)

End of Lesson 2

LESSON ASSIGNMENT

LESSON 3	Pulse.
LESSON ASSIGNMENT	Paragraphs 3-1 through 3-5.
LESSON OBJECTIVES	After completing this lesson, you should be able to:

3-1. Identify the cause of a pulse.

3-2. Identify types of pulse (normal regular, tachycardia, bradycardia, weak, thready, strong, bounding, intermittent, irregular, and so forth) and their meanings.

3-3. Identify locations for taking a pulse, including the most common sites.

3-4. Identify the proper procedures for determining a patient's pulse.

3-5. Take a person's pulse and calculate his pulse rate.

SUGGESTIONS After completing the assignment, complete the exercises at the end of this lesson. These exercises will help you to achieve the lesson objectives.

LESSON 3

PULSE

3-1. WHAT IS A PULSE?

A pulse is when the left ventricle of the heart contracts. When this happens, blood is suddenly pushed from the ventricle to the main artery (aorta). This sudden forcing of blood from the heart into the arteries causes two things to happen.

a. **Artery Expansion.** The sudden rush of blood increases the volume of blood in the arteries. In order to accept this increased volume, the arteries expand (stretch). As the arteries quickly contract (go back to normal size), blood is forced from the arteries, through the capillaries, and into the veins.

b. **Pulse.** In addition to the expansion of the arteries, a "wave" travels through the arteries. This wave is the pulse. All arteries have a pulse, but the pulse is easier to feel (palpate) when the artery is near the surface of the body.

3-2. WHAT IS PULSE RATE?

The pulse rate is the number of times that you can feel a pulse wave passing a point in one minute. Since a pulse wave occurs whenever the heart beats, the pulse rate equals the heartbeat rate. However, "taking a patient's pulse" means more than just determining his pulse rate. It also includes noting certain other factors about the pulse.

3-3. WHAT FACTORS ARE NOTED WHEN TAKING A PATIENT'S PULSE?

When taking a patient's pulse, you should note the patient's pulse rate, the strength of the pulse, and the regularity of the pulse. Most of the pulse characteristics discussed in this paragraph are illustrated in figure 3-1.

a. **Pulse Rate.**

(1) The normal adult has a pulse rate of about 72 beats each minute. Infants have higher average pulse rates. The normal pulse rate ranges based upon age are given below.

(a) Adults: 60 to 100 beats per minute.

(b) Children: 70 to 120 beats per minute.

(c) Toddlers: 90 to 150 beats per minute.

(d) Newborns: 120 to 160 beats per minute.

(2) Pulse rates that are outside the normal range are classified as tachycardia or bradycardia.

(a) Tachycardia. If the patient's pulse rate is over 100 beats per minute, the patient is said to have tachycardia. Tachycardia means "swift heart." Constant tachycardia could be a sign of certain diseases and heart problems. Often, however, tachycardia is only temporary. Temporary tachycardia can be caused by exercise, pain, strong emotion, excessive heat, fever, bleeding, or shock.

(b) Bradycardia. If the patient's pulse rate is below 50 beats per minute, the patient is said to have bradycardia. Bradycardia means "slow heart." Bradycardia can be sign of certain diseases and heart problems. Certain medicines, such as Digitalis, can result in bradycardia.

b. **Strength.** The strength (force) of the pulse is determined by the amount of blood forced into the artery by the heartbeat. A normal pulse has a normal strength. You will be able to identify a normal strength pulse with practice.

(1) Bounding. If the heart is pumping a large amount of blood with each heartbeat, the pulse will feel very strong. This strong pulse is called "bounding" pulse (as in "by leaps and bounds"). A bounding pulse can be caused by exercise, anxiety, or alcohol consumption.

(2) Weak. If the heart is pumping only a small amount of blood with each heartbeat, the pulse will be harder to detect. This type of pulse is called weak, feeble, or thready. If the pulse is weak, you may have trouble finding (palpating) the pulse at first.

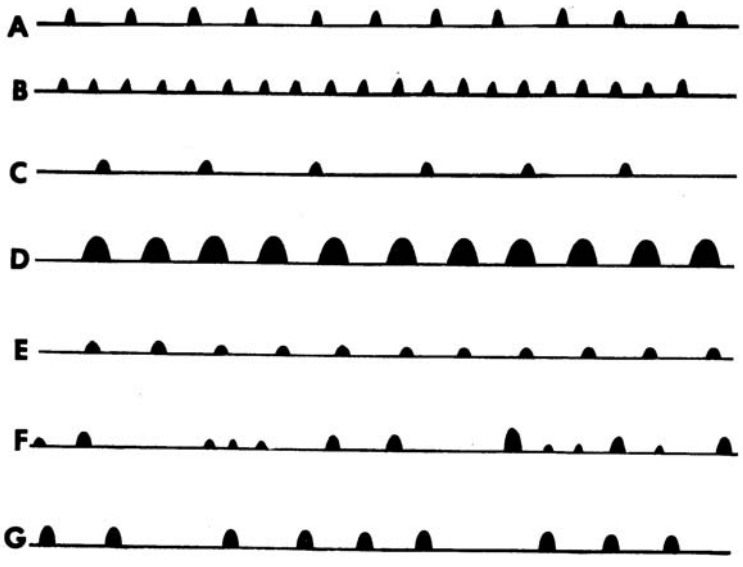
(3) Strong. A strong pulse is stronger than normal pulse, but is less than bounding. Shock and hemorrhage (serious bleeding) can cause a strong pulse.

c. **Rhythm.** Rhythm refers to the evenness of the beats. In a regular pulse, the time between beats is the same (constant) and the beats are of the same strength.

(1) Irregular. A pulse is irregular when the rhythm does not have an even pattern. The time between beats may change, or the strength of the beats may change or the pulse may vary in both time between beats and strength.

(2) Intermittent. An intermittent pulse is a special type of irregular pulse. A pulse is intermittent when the strength does not vary greatly, but a beat is skipped (missed) either at regular or irregular intervals. If the missing beats in an intermittent pulse were present, then the pulse rhythm would be normal.

NOTE: Examples of some pulse patterns are illustrated in figure 3-1.



A Regular.

B Tachycardia.

C Bradycardia,

D Bounding.

E Weak (thready).

F Irregular.

G Intermittent (irregular).

Figure 3-1. Pulse patterns.

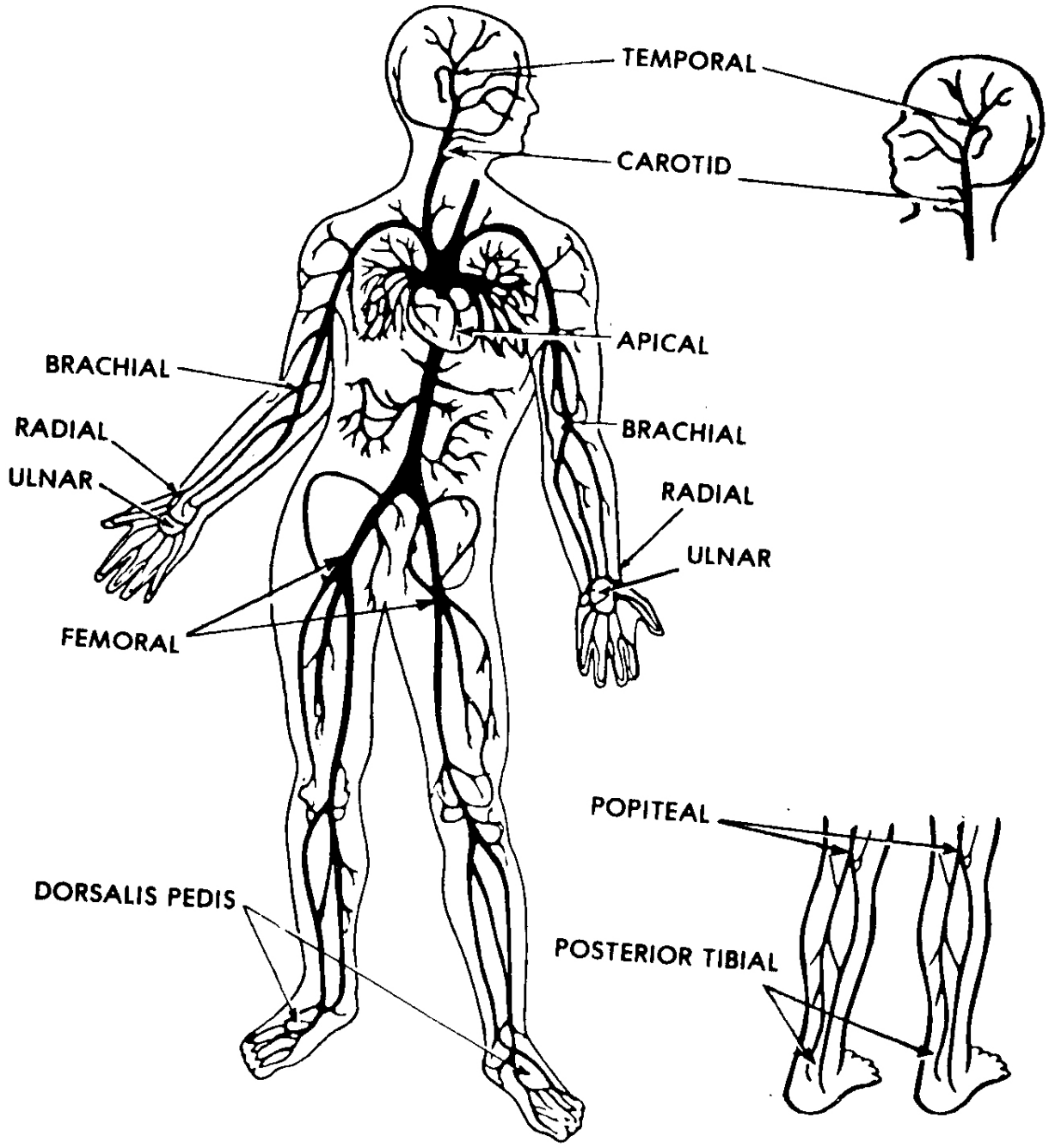
3-4. WHICH ARTERY IS PALPATED WHEN A PULSE IS TAKEN?

There are several sites on the body where a pulse is normally taken. All arteries have a pulse, but it is easier to palpate (feel) the pulse at certain locations. It is easier to feel the pulse when the artery is near the surface of the skin and when there is firm tissue (such as a bone) beneath the artery. The three most common sites are the radial (wrist), carotid (throat), and brachial (inside of elbow). These and other sites are discussed below and illustrated in figure 3-2. The site or sites that you choose to use may vary depending upon the condition of the patient. For example, suppose that you are assisting someone who is bleeding severely from a wound in his thigh. After giving the person first aid to stop the bleeding, you will check the person's pulse at a point below the injury to make sure that your bandage has not cut off the blood circulation to the lower leg. You may take the pulse at the popliteal (behind the knee) site, the dorsalis pedis (top of the foot) site, and/or the posterior tibial (back of the ankle) site.

a. **Radial.** The radial pulse (the pulse taken using the radial artery) is taken at a point where the radial artery crosses the bones of the wrist. If the patient's hand is turned so that the palm is up, the radial pulse is taken on the thumb side of top side of the wrist.

b. **Carotid.** The carotid pulse is taken on either side of the trachea (windpipe). The best location is the grooves located to the right and to the left of the larynx (Adam's apple).

c. **Brachial.** The brachial pulse is taken in the depression located about one-half inch above the crease on the inside (not the bony side) of the elbow. This site is used when taking the patient's blood pressure.



NOTE: All pulse sites except apical exist on both sides of the body. For example, one radial site exists on the right wrist and one exists on the left wrist.

Figure 3-2. Sites for taking a pulse.

d. **Temporal.** The temporal pulse is taken in the temple area on either side of the head. The temple area is located in front of the upper part of the ear. The pulse is felt just above a large, raised bony area called the zygomatic arch.

e. **Ulnar.** Like the radial pulse, the ulnar pulse is taken at the wrist. The radial pulse is taken over the artery on the thumb side of the wrist while the ulnar pulse is taken on the other side of the wrist. Both pulses are taken on the palm side of the wrist. The radial artery is normally preferred over the ulnar artery for taking the pulse because the radial artery is somewhat larger.

f. **Femoral.** The femoral pulse is taken in the groin area by pressing the right or left femoral artery against the ischium (the lower part of the pelvic bones located in the front part of the body).

g. **Popliteal.** The popliteal pulse is taken in the middle of the area located on the inside of the knee (the area opposite the kneecap).

h. **Posterior Tibial.** The posterior tibial pulse is taken at the top of the ankle or just above the ankle on the back, inside part of the ankle.

i. **Dorsalis Pedis.** The dorsalis pedis pulse is taken on the top portion of the foot just below the ankle. The pulse is taken in the middle of this area (not to the inside or outside).

j. **Apical.** Unlike the other sites, the apical pulse is not taken over an artery. Instead, it is taken over the heart itself. The apical pulse (actually, the heartbeat) can be felt over the apex of the heart (the pointed lower end of the heart.) This site is located to the (patient's) left of the breastbone and two to three inches above the bottom of the breastbone. The apical pulse is easily heard when a stethoscope is used.

3-5. HOW DO I TAKE A PATIENT'S PULSE?

The procedures for taking a patient's pulse are given below.

a. **Gather Materials.** You will need a clock or watch with a second hand, a pencil or pen, and something to write on (form, note pad, and so forth).

b. **Verify Patient's Identity.** If you are ordered to take a patient's pulse, make sure that you are taking the pulse of the proper patient. For example, check the patient's name on your orders against the name on his hospital identification bracelet or ask the patient his name.

NOTE: If you have already established the patient's identity, this step is skipped.

c. **Select Site.** Select a site for taking the patient's pulse. Normally, the radial site is usually chosen. The brachial and the carotid sites are other commonly used locations. These sites are normally used because of their availability and because little or no clothing have to be removed in order to expose these sites. Other sites may be used when you wish to check the blood circulation to a specific body part.

d. **Prepare Site.** Remove any clothing from over the site (open shirt for apical, remove boot and sock for dorsalis pedis, and so forth.). Then position the body part so that you can take the pulse easily.

NOTE: When taking a reclining patient's radial pulse, place the patient's arm across his chest as shown in figure 3-3. This will allow you to count his breaths after taking his pulse without having to move. The patient's breathing pattern may change if he knows you are watching his breathing.

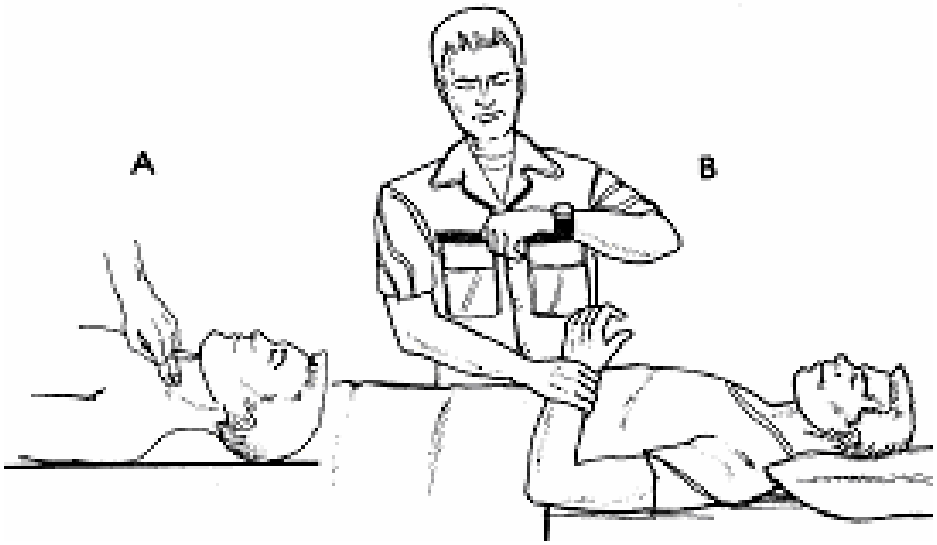


Figure 3-3. Taking a patient's pulse. A - carotid pulse. B - radial pulse.

e. **Locate Pulse.** Put the tips of your index finger and middle finger together and feel for the pulse by pressing down moderately with you fingertips on the site. If you cannot feel a pulse, move your fingertips around the area until you locate the pulse. Do not use your thumb to search for the patient's pulse. The thumb contains a blood vessel that is large enough for a pulse to be felt. If you use your thumb, the pulse that you find may be your own thumb pulse, not the patient's pulse.

NOTE: Some people prefer to use three fingers to take a pulse.

f. **Count Pulse Beats and Note Abnormalities.** Count the pulse beats felt during a 60-second period. Use the clock or watch. As you count the beats, note the strength and regularity (rhythm) of the beats.

NOTE: If you are using the dorsalis pedis site, use gentle pressure when palpating the artery. Too much pressure at this or other sites may press the artery closed and stop blood from flowing pass the site.

g. **Record Pulse Rate.** By convention (general agreement), the patient's pulse rate is recorded as an even number (ending in 0, 2, 4, 6, or 8). For example, if you counted 72 beats during the 60-second period, you would record "72." Suppose, however, that you had counted 83 beats during the 60-second period. Would you record a pulse rate of "82" or "84"? By convention, an odd pulse rate is recorded as the next higher rate. Therefore, a pulse rate of 83 would be recorded as "84."

NOTE: Once you have sufficient practice in taking pulses, you may wish to use a shorter method of determining the pulse rate of a patient with a regular pulse. You may count the number of pulse beats that you feel during a 30-second period and multiply this number by 2. If, for example, you counted 37 pulse beats during a 30-second period, you would record "74" (37 X 2 = 74). This method will always give you an even number as your pulse rate. This method is used only if the patient has a regular rhythm. If the patient has an irregular pulse, you must use a least a 60-second time period. Your SOP may require you to count the pulse beats for 120 seconds and divide by 2 if the patient's pulse is irregular.

h. **Record any Abnormalities.** If you noticed anything about the patient's pulse that is not normal (irregular, intermittent, thready, bounding, and so forth), record your observations on the form or piece of paper. If the patient's pulse is very different from the previous time (for example, a patient whose pulse was normal four hours ago and is now irregular), notify the appropriate nursing personnel.

i. **Take Pulse at Other Sites, if Needed.** Sometimes a pulse cannot be taken accurately at a particular site because of blockage in the artery or other reasons. In such a case, you should take a pulse at another site in order to check your results. Sometimes a physician will order that the apical pulse be taken in addition to the pulse at another site. Such a procedure allows the physician to check the pulse at a particular site against the rate and characteristics of the actual heartbeat (apical pulse).

Continue with Exercises

EXERCISES: LESSON 3

INSTRUCTIONS. The following exercises are to be answered by matching the numbered stem with lettered response that best matches the stem, by writing the answer in the space provided, or performing the stated actions. After you have completed all the exercises, turn to "Solutions to Exercises" at the end of the lesson and check your answers.

1. When the heart beats (pumps blood), a pressure wave is created which travels throughout the arteries. This wave is called the _____.

2. The patient's pulse rate is the number of times that a pulse can the felt during a(n) _____ period.

SPECIAL INSTRUCTIONS FOR EXERCISES 3 THRU 10. Match the term in Column I with the appropriate description in Column II by writing the letter of the description in the blank preceding the term.

Column I--Terms	Column II--Descriptions
_____ 3. Bounding pulse	a. 60-100 beats per minute, normal strength, steady rhythm.
_____ 4. Intermittent pulse	b. Over 100 beats per minute.
_____ 5. Normal pulse	c. More forceful than normal.
_____ 6. Thready pulse	d. Not a steady rhythm.
_____ 7. Irregular pulse	e. Skipping a beat every few beats.
_____ 8. Bradycardia	f. A weak pulse, may be difficult to find at first.
_____ 9. Strong pulse	g. Less than 50 beats per minute.
_____10. Tachycardia	h. A very strong, forceful pulse.

SPECIAL INSTRUCTIONS FOR EXERCISES 11 THRU 14. Match the pulse sites in Column I with the appropriate body parts in Column II.

Column I	Column II
_____11. Carotid	a. Chest (over heart)
_____12. Dorsalis pedis	b. Throat
_____13. Radial	c. Wrist
_____14. Apical	d. Top of foot

15. Find the temporal, carotid, apical, brachial, radial, ulnar, femoral, popliteal, posterior tibial, and dorsalis pedis pulse sites on your own body. Make sure that you can feel the pulse.

16. Ask a friend to assist you. Determine the person's pulse rate using the radial pulse site, the carotid pulse site, and the dorsalis pedis pulse site. Record each pulse rate.

Check Your Answers on Next Page

SOLUTIONS TO EXERCISES: LESSON 3

1. Pulse (para 3-1b)
2. 1 minute (or 60 seconds) (para 3-2)
3. h (para 3-3b(1))
4. e (para 3-3c(2))
5. a (para 3-3a,b,c)
6. f (para 3-3b(2))
7. d (para 3-3c(1))
8. g (para 3-3a(1))
9. c (para 3-3b(3))
10. b (para 3-3a(2))
11. b (para 3-4b)
12. d (para 3-4i)
13. c (para 3-4a)
14. a (para 3-4j)
15. Refer to figure 3-2 for locations (para 3-4)
16. Did you do the following each time?
    a. Position the person so that he was comfortable and you could reach the pulse site easily.
    b. Locate the pulse using two or three fingertips (no thumb).
    c. Take the pulse for a full 60 seconds (again using two or three fingertips and no thumb).
    d. Note any irregularities in the person's pulse rhythm.
    e. Record the pulse rate as an even number. The pulse rates may vary slightly (para 3-5).

End of Lesson 3

LESSON ASSIGNMENT

LESSON 4	Breathing.
LESSON ASSIGNMENT	Paragraphs 4-1 through 4-6.
LESSON OBJECTIVES	After completing this lesson, you should be able to:

4-1. Identify the function of breathing.

4-2. Identify the two muscle systems that are primarily responsible for breathing and how they work.

4-3. Identify factors that are noted while taking a patient's breathing rate.

4-4. Identify the procedures for determining a patient's breathing rate.

4-5. Take a person's breathing rate.

4-6. Identify terms associated with normal and abnormal breathing (such as rapid, shallow, irregular rhythm, and productive cough) and the meanings of the terms.

4-7. Identify why a patient should be unaware that you are counting his breathing.

SUGGESTIONS After completing the assignment, complete the exercises at the end of this lesson. These exercises will help you to achieve the lesson objectives.

LESSON 4

BREATHING

4-1. WHAT IS BREATHING?

Basically, breathing is ventilation. Ventilation is the mechanical act of moving air in and out of your lungs. Respiration is commonly confused with ventilation. Respiration takes place at the cellular level when oxygen diffuses on to the red blood cells and carbon dioxide diffuses into the lung to be exhaled. When you inhale (breathe in), fresh air enters your lungs. The lungs take oxygen from the air and add carbon dioxide to the air. When you exhale (breathe out), you force the air from your lungs back into the environment. You do not, however, force all the air out of your lungs when you exhale. A person takes in about 500 ml of air when he inhales normally and exhales the same amount. After a normal exhale, the lungs will still contain about 2300 ml of air.

a. **Oxygen.** The oxygen diffused from the air by the lungs is absorbed by the red blood cells in the blood and taken to all parts of the body. Diffusion is the movement of molecules from an area of higher concentration (the air) to an area of lower concentration (the blood cells). The body cells use the oxygen to change stored energy in the form of sugars and fats into usable energy. In addition to producing energy, the process produces certain waste products, including carbon dioxide.

b. **Carbon Dioxide.** Carbon dioxide (CO_2) is a byproduct of cellular respiration and is carried in the blood stream as carbonic acid from the cells to the lungs. When the carbon dioxide reaches the lungs, it has a higher concentration than the air and it diffuses out of the blood to be exhaled in to the environment.

4-2. WHAT CAUSES BREATHING TO OCCUR?

Ventilation is caused by two muscle systems--the diaphragm and the intercostal muscles. When the diaphragm and the intercostal muscles contract (get shorter), they make the chest cavity larger. The lungs then expand in order to fill up the space. When the lungs expand, air from the outside environment rushes in through the mouth or nose to fill up this extra space. When the muscles relax, the chest cavity returns to its normal size. This action compresses the air in the lungs and forces in some of the air from the lungs, through the windpipe, and out of the nose or mouth.

a. **Diaphragm.** The diaphragm is a large dome-shaped muscle that separates the chest cavity from the abdominal cavity. When the diaphragm contracts, the muscle flattens somewhat and "lowers the floor" of the chest cavity (figure 4-1). When the muscle relaxes, it returns to its normal (dome) shape. The diaphragm is responsible for most of the air movement during breathing. The diaphragm is a skeletal muscle that is under involuntary control of the part of the brain that controls breathing.

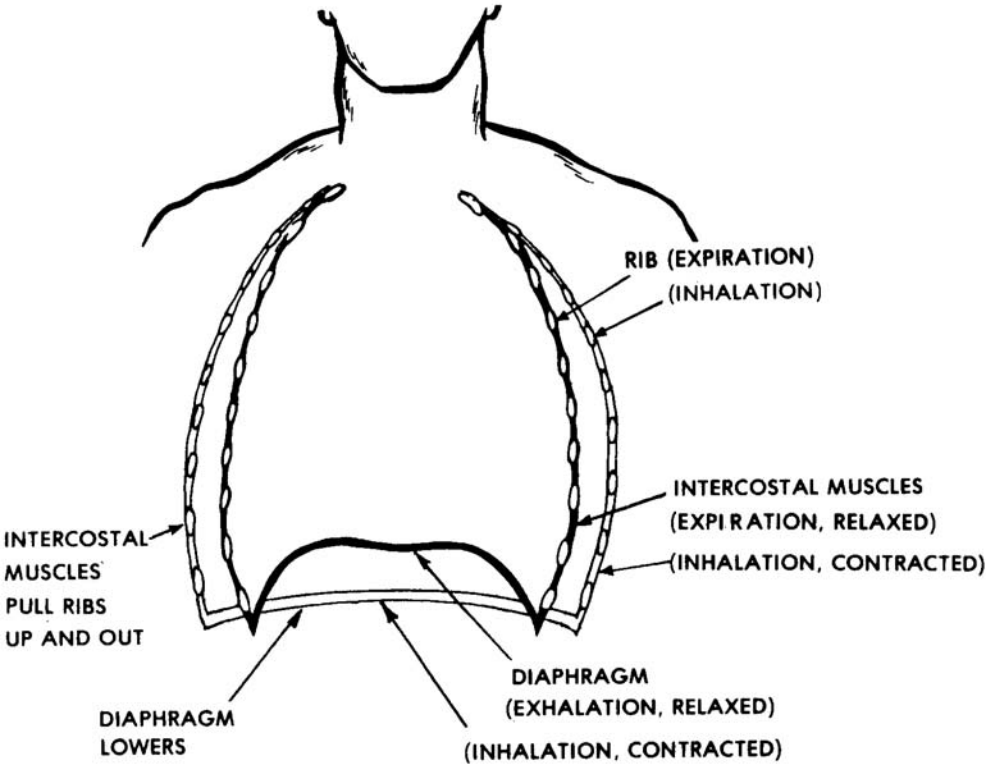


Figure 4-1. Actions of diaphragm and rib cage in breathing.

b. **Intercostal Muscles.** The intercostal muscles are the muscles that connect one rib to another rib. When the muscles contract (shorten), the ribs are pulled up and out. This action causes the entire rib cage to move up and out (away from the body) as illustrated in figure 4-1. This up and out motion causes the circumference of the chest to increase.

4-3. WHAT IS A BREATHING RATE?

A patient's breathing rate is the number of complete cycles of inhalation and exhalation that the patient performs in one minute. Like the pulse, however, taking a patient's breathing consists of more than just counting the number of times that he breathes.

4-4. WHAT FACTORS ARE NOTED WHEN TAKING A PATIENT'S BREATHING RATE AND QUALITY?

When taking a patient's breathing (ventilation) rate, you should note his breathing rate, the depth and rhythm of his ventilations, the quality of his ventilations, and any factor (such as coughing) that is not normal. Breathing should be effortless and barely noticeable. If it is labored or noisy, too fast, or too slow, then it is not normal and should be treated aggressively.

a. **Rate.** A normal adult will breathe at a steady rate. A breathing rate from 12 to 20 breaths per minute is normal. Children have a normal breathing rate of 20 to 28 breaths per minute. Infants have a normal range of 30 to 60 breaths per minute.

(1) Normal. A patient's breathing rate is said to be normal if it is within the appropriate range. For example, a breathing rate of 26 is normal for a young child, slow for an infant, and rapid for an adult.

(2) Rapid. If a patient's breathing rate is higher than the normal range, then his breathing is rapid. Rapid breathing is also known as hyperventilation.

(3) Slow. If a patient's breathing rate is below the normal range, his breathing is slow.

b. **Depth.** The depth of ventilation refers to the amount of air that is inhaled and exhaled. The amount of air inhaled and exhaled in one cycle is called the tidal volume. The more the chest cavity expands, the greater the depth of the ventilation. Full expansion of the chest wall with full relaxation on exhalation is a good indicator of adequate depth of breathing and adequate tidal volume. Many books will try and apply numbers in milliliters per breath to calculate tidal volume. This is not possible to measure in the field, so it is important to asses the expansion of the chest to help determine tidal volume.

(1) Normal. Normal depth of breathing is hard to determine. The chest will not expand to its full capacity with each breath. If a patient is not showing signs of distress, is alert, and has a normal skin color, then you can gauge that the breathing depth is normal and adequate for his condition. Airflow of about 500 ml each breath is normal in an adult.

(2) Shallow. If a patient's chest and abdomen rise and fall only slightly, the patient's breathing is shallow. A patient with shallow breathing will probably breathe at a rapid rate. If a patient has a pattern of rapid, shallow breathing, he is said to be "short of breath." Rapid and shallow breathing will not get a high enough tidal volume to allow the air to reach the lungs for good oxygenation. A pattern of slow, shallow breathing is called "hypoventilation."

(3) Deep. A patient's breathing is deep when the chest cavity expands to almost its full capacity. A person who is gasping for air expands his chest to its full capacity. A breathing pattern of rapid, deep breathing is called "hyperventilation."

c. **Rhythm.** The rhythm includes the entire breathing (inhalation and exhalation) cycle.

(1) Regular. The normal breathing rhythm (pattern) is: inhalation, pause, exhalation, pause. The exhalation phase of the cycle usually lasts about twice as long as the inhalation phase. The cycles are repeated at a steady pace.

(2) Irregular. A change from the normal breathing pattern is an irregular pattern. An irregular breathing pattern may indicate the presence of illness. It is not unusual for painful breathing to be associated with an irregular breathing pattern. Some irregular patterns are given below.

(a) Cheyne-Stokes. Cheyne-Stokes breathing is a pattern in which the breathing increases and decreases in depth with regularly recurring periods when the patient does not breathe at all. Cheyne-Stokes breathing is usually associated with severe head trauma that interrupts the breathing center in the brain, causing the irregular breathing pattern. It can also be seen in acute mountain sickness as the body tries to compensate for the lower oxygen levels at higher altitudes.

(b) Kussmaul. Kussmaul breathing pattern is a compensatory mechanism that is often seen in diabetic patients. This breathing pattern is very deep and rapid as the body attempts to lower the acid levels that are created in diabetic ketoacidosis. It is also associated with crush syndrome (renal failure following the crushing of a large muscle mass).

(c) Agonal. Agonal breathing is the body's last attempts to save itself. The patterns of occasional gasping breaths that can often occur after the heart has stopped are not effective in moving air. This is a primal reflex that is seen as a patient dies.

d. **Quality.** Breathing can be of normal or abnormal quality.

(1) Normal. Normal breathing does not require conscious effort. It is automatic, regular, and even. It produces no noise, discomfort, or pain.

(2) Abnormal. Breathing that is not normal is abnormal.

(a) Pain. Injuries to the chest and certain diseases can cause pain when breathing.

(b) Labored breathing. Labored breathing occurs when the person is trying to get as much air into his lungs as possible. It is also called "air hunger" and "dyspnea." Labored breathing is normal when due to vigorous work or athletic activity.

(c) Wheezing. Wheezing is difficult breathing accompanied by whistling sounds on exhalation. Wheezing often occurs in patients with asthma (difficulty in breathing caused by spasms in the bronchial tubes and excessive mucous production) and emphysema (a condition caused by damaged lung tissue).

(d) Noise. Sounds such as rattling or bubbling sounds indicate breathing problems.

(e) Stridor. Stridor is a high-pitched whistling sound, usually with inhalation. Stridor is a serious sign that indicates an upper airway obstruction.

e. **Unusual Position.** Sometimes a patient will position himself in order to make breathing easier. For example, a patient may lean forward and brace his arms against his knees or the bed in order to breathe more normally. This is known as the tripod position and should be noted during your assessment.

f. **Coughing.** A cough is a sudden and noisy expulsion of air from the lungs. It is usually produced to remove secretions and foreign matter (dust, smoke, sprays, and so forth) from the lungs. A cough can be acute or chronic, productive or nonproductive.

(1) Acute. An acute cough is a cough that came on suddenly.

(2) Chronic. A chronic cough is a cough that has existed for a long time (not acute).

(3) Productive. A productive cough is a cough accompanied by sputum expelled from the lungs.

(4) Nonproductive. A nonproductive cough does not contain sputum. It is also called a dry cough.

g. **Sputum.** Sputum is mucous material that is expelled (coughed up) from the lungs. It is not saliva. Saliva is produced by the salivary glands in the mouth to keep the mouth moist and to help in the chewing and swallowing of food. If the patient's cough is productive, note the amount, color, character, and odor of the sputum.

(1) Amount. The amount may be scant, moderate, or copious.

(a) Scant. Scant means a small amount.

(b) Copious. Copious means a large amount.

(c) Moderate. A moderate amount is more than scant but less than copious.

(2) Color. Normal sputum is clear. Abnormal sputum, such as caused by a lung disease, may be green, yellow, reddish or pinkish (mixed with blood), or gray.

(3) Character. Sputum may be watery, semi-liquid, viscous, or frothy.

(a) Watery. Watery sputum is thin and usually colorless.

(b) Viscous. Viscous sputum is very thick, firm, and stays together.

(c) Semi-liquid. The normal thickness of sputum is semi-liquid. It is thicker than watery sputum but not as thick as viscous sputum.

(d) Frothy. Frothy sputum is foam-like and contains many small air bubbles.

(4) Odor. Normal sputum has little or no odor. Abnormal sputum may have a sweaty smell or a foul and offensive smell.

4-5. HOW DO I ASSESS A PATIENT'S BREATHING RATE AND QUALITY?

You normally assess the patient's breathing when you are taking his pulse. Take his pulse in such a manner that you do not need to move in order to observe his breathing also. The best position is the position shown in figure 3-3 A. If you are not to take his pulse also, observe his breathing when he is at rest (usually lying down) and not aware that you are observing his breathing.

a. **Counting Breaths.** When you finish counting the patient's pulse rate, count the patient's breaths (the rising and falling of his chest) before recording his pulse rate. Continue to hold his wrist as though you were still counting his pulse rate.

(1) Count the number of complete breaths (the sequence of inhalation and exhalation is one breath) that occur during a 60-second period.

(2) After you have practice, you can count the number of breaths that occur during 30 seconds and multiply that number by two. This procedure, however, can only be used if the patient's breathing is regular. If his breathing is irregular, count for the full 60 seconds.

b. **Note Abnormalities.** As you count the patient's breaths, look and listen for abnormalities (rapid or slow breathing, shallow or deep breathing, irregular breathing, noises, indications of pain, coughing, and so forth).

c. **Record Breathing Rate and Quality.** Record the number of complete breathing cycles per minute on your form or sheet of paper. The number can be either even or odd. Suppose your 60-second period began as the patient started to inhale. Also suppose that he had 15 complete breaths plus one full inhalation (no exhalation) when the 60 seconds expired. You would record his rate as "15" since only complete cycles (inhalation and exhalation) are to be counted.

d. **Record Any Abnormalities.** Record any abnormalities noted while assessing the patient's breathing.

4-6. WHY SHOULD THE PATIENT BE UNAWARE THAT I AM ASSESSING HIS BREATHING RATE AND QUALITY?

Your brain controls your breathing and will do so automatically (without conscious order). This means you will continue to breathe even when you are not thinking about breathing, such as when you are asleep. However, breathing can also be under the conscious (voluntary) control of the brain. You can breathe faster, breathe deeper, breathe shallower, or breathe slower if you want to do so. You can even stop breathing altogether, at least for a short time. Thus, you can swim underwater and you can hold your breath while putting on your protective mask during a chemical attack. Unfortunately, this voluntary control of breathing can create a problem when you are assessing the patient's breathing rate and quality. If the patient knows that you are paying attention to his breathing, then he will probably start paying attention to his breathing also. In doing so, his brain switches from automatic control of breathing (which you want to observe) to voluntary control (which does not give you a true picture of his normal breathing). In order to get a true picture of the patient's breathing rate and quality, the patient should be at rest (lying down) and should not beware that you are observing his breathing process.

Continue with Exercises

EXERCISES: LESSON 4

INSTRUCTIONS. The following exercises are to be answered by marking the lettered response that best answers the question or best completes the incomplete statement or by writing the answer in the space provided. After you have completed all the exercises, turn to "Solutions to Exercises" at the end of the lesson and check your answers.

1. The muscle or group of muscles that is responsible for most of the air movement into and out of the lungs is/are the:

   a. Shoulder muscles.

   b. Abdominal muscles.

   c. Intercostal muscles.

   d. Diaphragm.

   e. Larynx.

2. Consider the following breathing patterns for an adult patient.

Time	Patient Actions
0 sec	
	Inhale-exhale
4 sec	
	Inhale-exhale
8 sec	
	Inhale-exhale
12 sec	
	Inhale-exhale
17 sec	
	Inhale-exhale
21 sec	
	Inhale-exhale
25 sec	
	Inhale-exhale
30 sec	

   What is the patient's breathing rate? _____

3. How would you describe the patient's breathing rate in exercise 2?

   a. Deep.

   b. Normal.

   c. Productive.

   d. Rapid.

   e. Slow.

SPECIAL INSTRUCTIONS FOR EXERCISES 4 THRU 11. Match the term in Column I with its meaning in Column II by writing the letter of the meaning in the blank.

Column I	Column II
_____ 4. Sputum	a. Breathing accompanied by whistling sounds.
_____ 5. Viscous	b. Cough that has existed for a long time.
_____ 6. Acute	c. 6-10 breaths per minute.
_____ 7. Depth	d. Gasping for air.
_____ 8. Wheezing	e. Bracing arms against knees in order to breathe more normally.
_____ 9. Chronic	f. Cough that came on suddenly.
_____ 10. Normal adult breathing rate	g. 12-20 breaths per minute.
_____ 11. Labored breathing	h. Amount of air breathed in and out.
	i. Thick.
	j. Mucus coughed up from lungs.
	k. Mucus produced in the mouth and used in digestion of food.

12. Have a person lie down. Take his pulse. After taking his pulse, determine his breathing rate without letting him know that you are taking his breathing rate.

Check Your Answers on Next Page

SOLUTIONS TO EXERCISES: LESSON 4

1. d (para 4-2a)
2. 14 breaths per minute (7 breathing cycles X 2) (para 4-5a (2))
3. b (para 4-4a)
4. j (para 4-4g)
5. i (para 4-4g(3)(b))
6. f (para 4-4f(1))
7. h (para 4-4b)
8. a (para 4-4d(2)(c))
9. b (para 4-4f(2))
10. g (para 4-4a)
11. d (para 4-4d(2)(b))
12. "Patient" should not know that you counted his breaths (para 4-5).

End of Lesson 4

LESSON ASSIGNMENT

LESSON 5	Blood Pressure.
LESSON ASSIGNMENT	Paragraphs 5-1 through 5-7.
LESSON OBJECTIVES	After completing this lesson, you should be able to:

5-1. Identify the meanings of systolic and diastolic.

5-2. Identify the major parts of a sphygmomanometer and a stethoscope.

5-3. Identify how a sphygmomanometer measures blood pressure.

5-4. Identify normal and abnormal blood pressure ranges.

5-5. Identify factors that affect a person's blood pressure.

5-6. Identify the proper procedures for taking a patient's blood pressure with a stethoscope.

5-7. Identify the maximum amount of time that an inflated bladder should be left in place.

5-8. Identify the procedures for determining a patient's blood pressure without using a stethoscope.

SUGGESTIONS After completing the assignment, complete the exercises of this lesson. These exercises will help you to achieve the lesson objectives.

LESSON 5

BLOOD PRESSURE

5-1. WHAT IS BLOOD PRESSURE?

Blood pressure refers to the force (pressure) with which the blood presses against the walls of the blood vessel. All blood vessels--large or small, artery or vein--have blood pressure. However, the term blood pressure normally refers to the blood pressure of a major artery. Unlike the other vital signs discussed previously, it takes two numbers--the systolic pressure and the diastolic pressure--to describe this vital sign. Blood pressure is normally measured in millimeters of mercury (mm Hg). "Millimeters of mercury" is a standard unit for measuring pressure. It refers to how high a force (pressure) would cause a column of mercury (chemical symbol Hg) to rise in a tube. Figure 5-1 gives the general idea. The greater the pressure, the more mercury is forced up the tube.

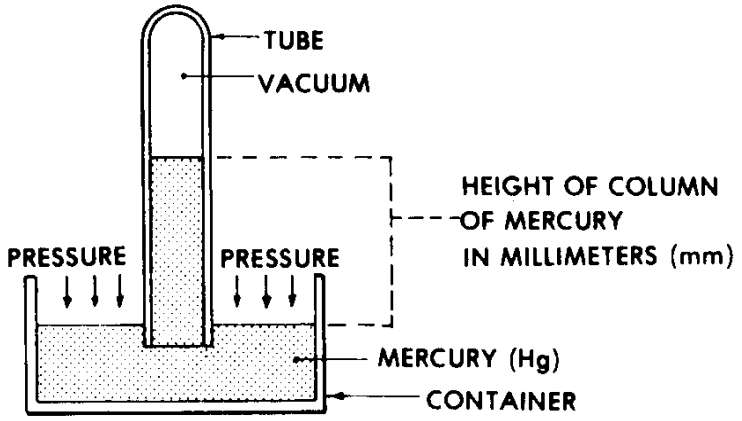


Figure 5-1. "Millimeters of mercury" as a measure of pressure.

5-2. WHAT ARE SYSTOLIC AND DIASTOLIC PRESSURES?

Basically, the systolic pressure is the greatest pressure that the blood exerts against the walls of the blood vessel while the diastolic is the lowest pressure that the blood exerts against the walls of the vessel. A person's blood pressure depends upon the force of the heart's pumping action, the degree to which the blood vessel will stretch, and the amount of blood in the blood vessel.

a. **Systolic.** The arteries are under the greatest pressure when the heart pumps blood into them. The extra blood that is forced into the arteries make them stretch.

(1) In a normal adult male, the systolic pressure should be between 100 and 140 mm Hg, inclusive. (Inclusive simply means to include the ends of the range. Systolic pressures of 100 and of 140 are within normal range.)

(2) In a normal adult female, the systolic pressure should be between 90 and 130 mm Hg, inclusive.

b. **Diastolic.** The arteries are under the least pressure from the blood when the heart is at rest (between pumps or beats) and the arteries have returned to their normal size.

(1) In a normal adult male, the diastolic pressure should be between 60 and 90 mm Hg, inclusive.

(2) In a normal adult female, the diastolic pressure should be between 50 and 80 mm Hg, inclusive.

5-3. WHAT FACTS AFFECT A PERSON'S BLOOD PRESSURE?

There are several factors that can affect a patient's blood pressure. Some are only temporary; others are long-term effects. A condition in which the blood pressure is considerably above normal is called "hypertension." If the blood pressure is too low, it is called "hypotension."

a. **Condition of Cardiovascular System.** A primary factor influencing a patient's blood pressure is the condition of his cardiovascular system (heart and blood vessels).

(1) If a patient's heart is not pumping blood with enough force, his blood pressure will be low. This will decrease the rate that blood is circulated throughout the body. Slow blood circulation may result in certain parts of the body (especially the brain) not receiving enough oxygen since oxygen is carried by the blood.

(2) If a patient's heart is pumping with too much force, his blood pressure will be high. If an artery has a weak spot, the force of the systolic pressure may be enough to rupture the artery and allow blood to escape.

(3) If a patient's arteries loose part of their elasticity, such as in patients who have arteriosclerosis (hardening of the arteries), the patient's blood pressure will be higher, since the artery walls stretch less and cannot relieve as much pressure.

b. **Age.** A person's blood pressure readings tend to increase as he grows older.

c. **Gender.** As indicated in paragraph 5-2, men tend to have higher blood pressure than women of the same age.

d. **Physical Fitness.** People who are physically fit tend to have more normal blood pressure than people who are "out of shape."

e. **Obesity.** People who are very overweight usually have higher blood pressure than they would if their weight were closer to their ideal weight.

f. **Pain.** Pain is a type of body defense that lets the brain know that something is wrong. The brain may respond to pain by increasing the rate and strength of heartbeats. The increased rate increases the amount of oxygen available to the muscles for producing energy. It also results in an increased blood pressure.

g. **Emotion.** Fear, worry, excitement, and similar emotions can result in a higher blood pressure. The brain may react to these emotions in basically the same way that it reacts to pain.

h. **Gravity.** If a person is standing, the blood pressure of the arteries in the lower part of the body will be greater than the pressure in the upper part of the body.

i. **Exercise.** A person's blood pressure is greater during and just after exercising because the heart beats faster in order to supply additional oxygen to the muscles.

j. **Disease.** Almost any disorder that affects the arteries or the renal (kidney) system will result in a higher blood pressure. Diseases that weaken the heart will usually result in a lower blood pressure.

k. **Drugs.** Drugs designed to strengthen the actions of the heart, such as digitalis, will cause the patient's blood pressure to rise. Drugs that cause the arteries to become smaller in diameter (called vasoconstrictors) will also cause the patient's blood pressure to rise. Drugs that cause the patient's arteries to become larger in diameter (called vasodilators) will decrease blood pressure.

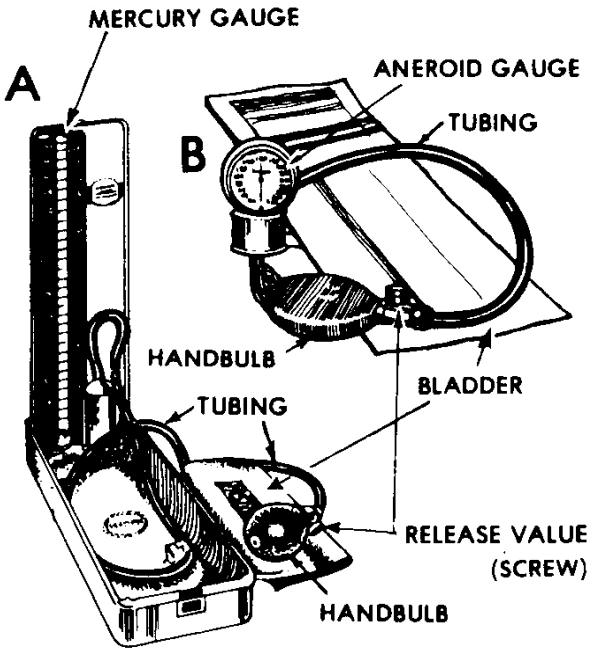
l. **Eating.** A person's blood pressure is usually elevated (increased) while he is eating and for a while after he finishes the meal.

m. **Bleeding.** Serious bleeding (hemorrhaging) reduces the amount of blood in the body's circulatory system and thus reduces blood pressure.

5-4. WHAT EQUIPMENT IS NEEDED TO MEASURE A PATIENT'S BLOOD PRESSURE?

You will need a sphygmomanometer (sfig'-mo-mah-NOM-e-ter) and a stethoscope (STETH-ah-skop).

a. **Sphygmomanometer.** The sphygmomanometer (figure 5-2) is usually called the "blood pressure cuff." There are several different types of blood pressure cuffs in use. Some are made to be attached to a wall (next to a patient's hospital bed, for example), but most are portable. All blood pressure cuff devices work basically in the same way and have the same parts--a bladder, a handbulb with release valve, a tube connecting the handbulb to the bladder, and a gauge (either mercury or aneroid) for measuring pressure.



A Portable mercury sphygmomanometer.
B Portable aneroid sphygmomanometer.

Figure 5-2. Sphygmomanometers.

(1) Bladder. The bladder (also called the "cuff") is a long rubber bag about 6 inches wide and 24 inches long that is covered with fabric. The bladder is wrapped around the patient's arm and filled with air when taking the patient's blood pressure. Parts of the fabric are made of non-slip material, such as Velcro. When the fabric is overlapped, the two pieces of fabric adhere to each other and will not slip when the bladder is inflated. Some sphygmomanometers use snaps or other devices to secure the bladder instead of non-slip fabric.

(2) Handbulb. The handbulb is a device for inflating the bladder. When squeezed, the handbulb forces the air through an opening connected to the tubing. When the bulb is released, it refills with air from the environment. The handbulb is designed so that air from the tubing cannot flow back into the handbulb.

(3) Rubber tubes. One tube connects the bladder and handbulb. Air that is forced out of the handbulb travels through the tube and enters the bladder. A second tube connects the bladder and the gauge.

(4) Release valve. The release valve (screw) is a device for releasing air from the bladder. It is located between the handbulb and the tubing. One hand can operate both the handbulb and the release valve easily. The valve is controlled by a screw. When tightened, no air escapes. When unscrewed fully, the air escapes rapidly. (Note: The screw does not separate from the apparatus. "Unscrewed fully" means the screw is turned so that air will escape as fast as possible.) The screw can also be turned to any position between completely closed and full release. In this way, you can let air escape from the bladder as quickly or as slowly as you wish.

(5) Gauge. The gauge measures the air pressure in the bladder. There are two types of gauges--the mercury gauge and the aneroid gauge.

(a) Mercury. The mercury gauge has a column of mercury in a glass tube. The column of mercury measures the air pressure in the bladder. The higher the pressure of air in the bladder, the higher the column of mercury. The height of the column of mercury is determined using a scale to the side of the tube containing the mercury. Usually there is a scale on each side of the glass tube in order to make it easier to read the height of the column. As air is released from the bladder, the air pressure drops and the column of mercury becomes shorter.

(b) Aneroid. The aneroid gauge is circular and has a dial. The greater the air pressure in the bladder, the farther the needle on the dial rotates. A scale on the dial is equivalent to the scale of the mercury gauge. Both scales measure the force of air pressure in the bladder in terms of mm Hg. As the air pressure is released, the needle moves in a counter-clockwise direction. The gauge will normally be designed so that it can be attached to the bladder. This frees the person taking the blood pressure from having to hold the gauge in one of his hands.

b. **Stethoscope.** The stethoscope is an instrument used for listening to sounds produced within the body. A stethoscope consists of a diaphragm, metal and rubber tubing, and earpieces (figure 5-3).

(1) Diaphragm. The diaphragm is normally a flat metal disk that is placed on the body area being examined. The diaphragm will pick up sounds produced within the body such as the heartbeat and breathing sounds. Sometimes a bell-shaped listening device is used instead of a flat disk. Some stethoscopes have combination (both flat disk and bell) listening devices.

(2) Tubing. The hollow and metal tubes transmit the sounds from the diaphragm to the earpieces. The rubber tubing provides flexibility.

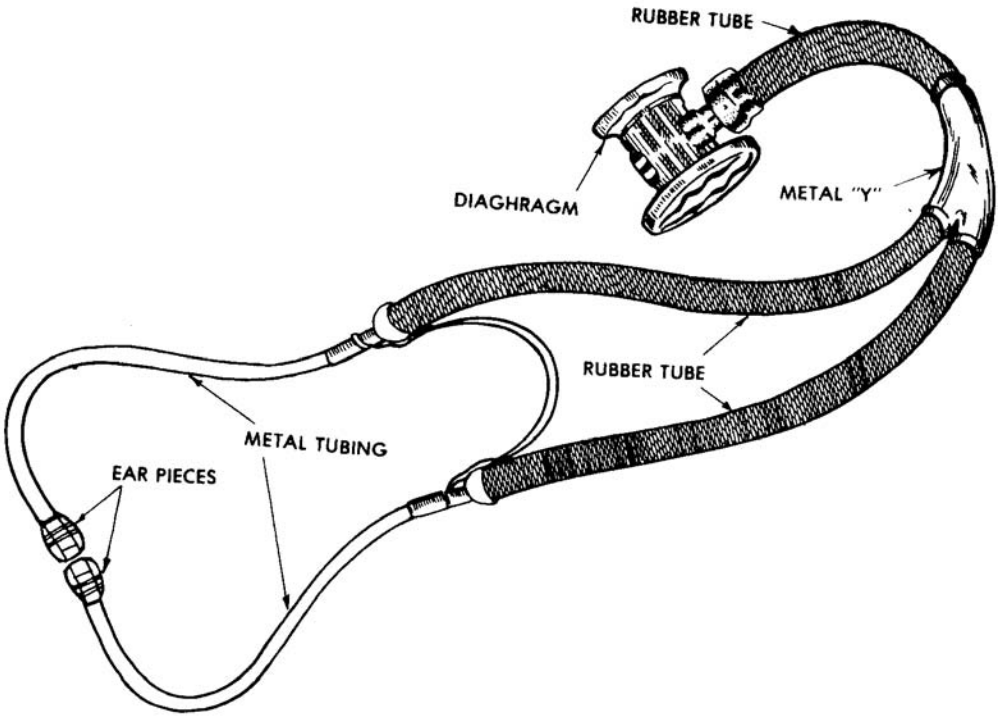


Figure 5-3. Stethoscope.

(3) Earpieces. The earpieces are twisted metal tubes with plastic ends. The plastic pieces protect the ears from the metal. The twisting helps to improve the quality of sound heard through the stethoscope. The stethoscope should be worn with the earpieces forward (figure 5-4) to help prevent the sounds picked up by the diaphragm from being distorted.

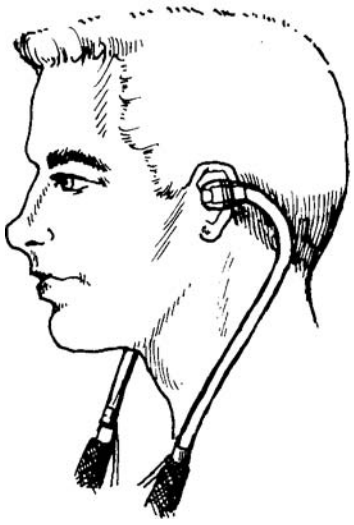


Figure 5-4. Earpiece of stethoscope in place for use.

5-5. HOW DOES THE AIR PRESSURE INSIDE THE BLADDER PROVIDE INFORMATION ABOUT THE BLOOD PRESSURE?

Paragraph 5-1 stated that blood pressure is the force with which the blood pushes against the walls of the blood vessel. However, paragraph 5-3a(5) states that the gauge on the sphygmomanometer measures the air pressure inside the bladder!

a. **Indirect Measurement.** Some things cannot be measured directly without difficulty. For example, the height of a building can be measured by climbing to the top of the building, holding on to one end of a very long tape measure, and dropping the other end to a friend on the ground who reads off the height. This method may work for a building that is not very high, but is not recommended for determining the height of the Empire State Building. The height of a building, however, can be determined indirectly, such as by measuring its shadow. (Method: Put a stick in the ground so that it is straight up and down. Measure the height of the stick, the length of the stick's shadow, and the length of the building's shadow. The height of the building is equal to the length of the building's shadow times the height of the stick divided by the length of the stick's shadow.)

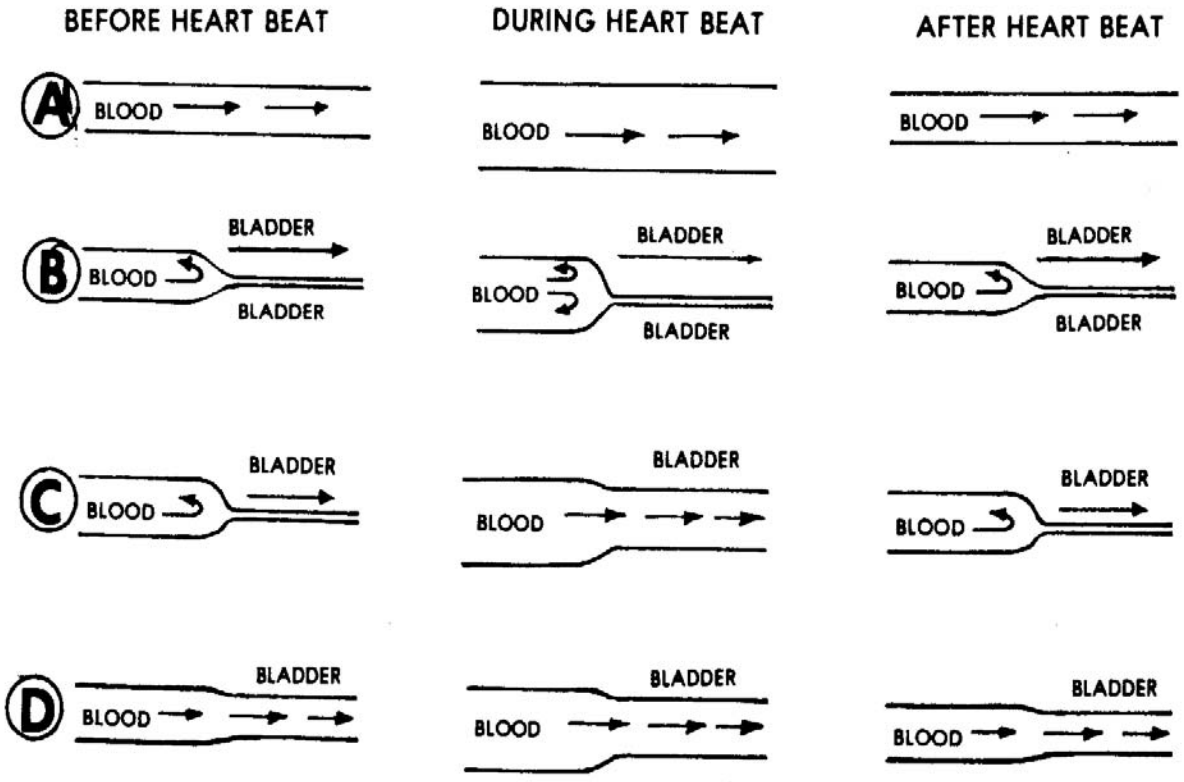
b. **Blood Pressure Measurement.** Just as the height of the building was determined by measuring something else (its shadow), the pressure of the blood at its highest (systolic) and normal (diastolic) levels can be determined by measuring the air pressure in the bladder.

(1) When the bladder is first placed around the arm and not inflated, the artery beneath the bladder functions normally (figure 5-5 A).

(2) When the bladder is inflated, the bladder squeezes the arm. If the bladder is inflated to a pressure greater than the systolic pressure of the artery, the artery beneath the bladder will collapse (figure 5-5 B). The artery will remain collapsed, thus shutting off blood flow below the bladder, even when there is a heartbeat. Thus, when there is no blood flow in the artery below the bladder, you know that the air pressure in the bladder is greater than the systolic blood pressure.

(3) When the bladder is inflated to a pressure that is less than the systolic pressure but greater than the diastolic pressure, blood will flow beneath the bladder only when the (blood) pressure within the artery is greater than the (air) pressure within the bladder. This occurs when the force of the heartbeat increases the pressure within the artery. Once the additional force of the heartbeat has passed (the artery returns to diastolic pressure), the artery will collapse again (figure 5-5 C). Thus, when blood suddenly passes through the artery beneath the bladder, stops, starts again, and stops again, you know that the pressure within the bladder is less than the systolic pressure but more than the diastolic pressure.

(4) If the bladder is inflated, but the pressure within the bladder is less than the lowest level of pressure within the artery (diastolic pressure), then the bladder cannot collapse the artery. The pressure of the bladder may interfere somewhat with the blood flow, but it cannot stop the blood flow (figure 5-5 D). Thus, when the blood continues to flow through the artery beneath the bladder without stopping, you know that the pressure within the bladder is less than the lowest (diastolic) pressure of the blood within the artery.



A Artery without the bladder--artery expands during heartbeat, returns to normal.
B Air pressure in the bladder is greater than the systolic pressure--the artery stays collapsed.
C Air pressure in bladder is between systolic pressure and diastolic pressure--artery collapsed except during heartbeat.
D Air pressure in bladder is less than diastolic pressure--artery does not collapse.

Figure 5-5. Effects of an inflated bladder on an artery.

5-6. HOW DO I TAKE A PATIENT'S BLOOD PRESSURE?

Use the following procedures when taking a patient's blood pressure.

a. **Gather Materials.** You will need the following items:

(1) Sphygmomanometer.

(2) Stethoscope.

(3) Cotton-tipped applicators (swabs)--at least 8.

(4) Disinfecting solution (70% alcohol solution).

(5) Watch or clock with second hand.

(6) Pen or pencil.

(7) Form or note pad on which to write.

b. **Verify the Patient's Identity.** Make sure that you are preparing to take the blood pressure of the proper person.

c. **Set up Equipment.** If you have a portable mercury sphygmomanometer, set up the gauge so that it will be at about eye level. If you are using an aneroid gauge, position yourself or the patient so that the gauge will be about eye level when you read it. You can read a gauge easier and more accurately when it is at eye level.

d. **Clean Earpieces.** Wet one swap with the alcohol disinfecting solution. Clean the inside of one plastic earpiece of the stethoscope with the swab and discard the swab. Wet another swab, clean the outside of the plastic earpiece, and discard that swab also. Repeat the procedure for the other plastic earpiece.

e. **Position the Patient.** Have the patient to position himself in the desired position.

(1) The blood pressure is normally taken using the patient's upper arm. The patient can stand, sit, or lie down. Normally, the patient will sit with his arm resting on a table or lie down with his arm resting on the bed, cot, or ground.

(2) Sometimes, the physician orders that the patient's blood pressure be taken on his thigh instead of on his arm. (The patient's arms may be injured or amputated, for example.) If the blood pressure is to be taken using the thigh, have the patient to lie on his abdomen. If the patient cannot lie on his abdomen, have him to lie on his back with his knees flexed.

f. **Expose the Site.** Have the patient expose the site to be used (upper arm or thigh). Assist the patient as needed. The patient may need to remove a long sleeve shirt or lower his pajama bottoms. The bladder must be placed over the patient's flesh, not his clothing. Rolling a shirt-sleeve or pants leg up could create a tight area above the site where the bladder is applied. This extra tightening could cause the blood pressure readings to be inaccurate. Therefore, it is better to remove a long sleeve shirt or pants rather than rolling them up.

g. **Explain Procedure to Patient.** Briefly tell the patient what you are going to do. The explanation can be combined with instructing the patient to expose the site where the bladder will be applied. Warn the patient that his arm (leg) may be uncomfortable while the bag (bladder) around his arm (leg) is inflated, but reassure the patient that the discomfort will only last 1 or 2 minutes.

h. **Prepare Bladder.** Make sure that the bladder is completely deflated. If air is present in the bladder, open the release valve, force the air out of the bladder, and close the valve.

i. **Prepare Gauge.** If a mercury gauge is being used, place the gauge where it can easily read, yet not in the way. If an aneroid gauge is being used, attach it to the bladder.

j. **Position Patient's Limb.**

(1) If the bladder is to be applied to the patient's upper arm and there is a support for the patient's arm (bed, table, ground, etc.), have the patient to extend his arm in a palm up position. The arm should be about the same level as his heart.

(2) If the bladder is to be applied to the patient's upper arm but there is no support for his arm, tuck his wrist under your arm so that you will be supporting his arm and keeping it steady.

(3) If the bladder is to be applied to the patient's thigh, the patient should remain lying on his abdomen or lying on his back with his knee flexed.

k. **Wrap Bladder Around Limb.**

(1) If the upper arm is being used, wrap the bladder around the upper arm. The non-slip material or buckles of the bladder should be on the outside of the bladder, not next to the patient's skin. The bottom edge of the bladder should be one to two inches above the elbow (figure 5-6).

(2) If the thigh is being used, wrap the bladder around the middle of the thigh (figure 5-7). A somewhat larger and longer bladder is normally used when the blood pressure is taken in the thigh.

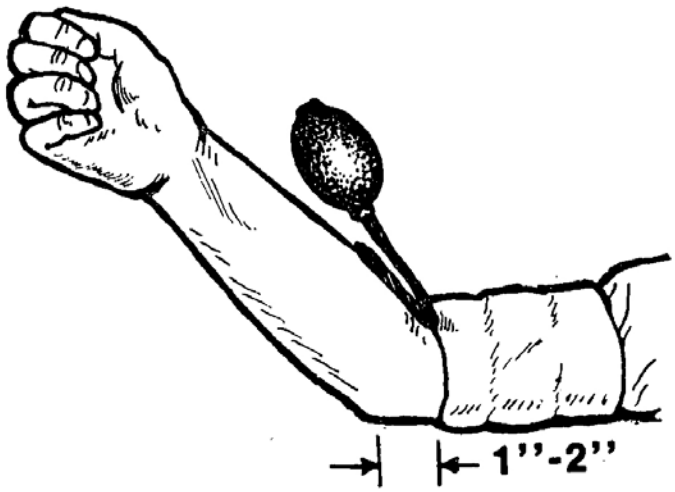


Figure 5-6. Placement of bladder on upper arm.

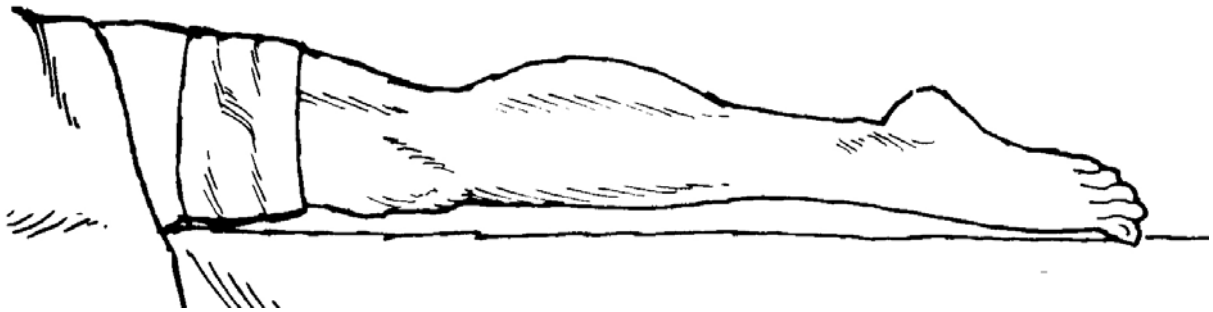


Figure 5-7. Placement of bladder on thigh.

(3) Wrap the bladder firmly around the limb. Overlap the fabric and make sure it will not slip (Velcro to Velcro, fasten buckles, tuck fabric end under bladder, etc.).

(4) If an aneroid gauge is being used, wrap the bladder so that the gauge is aligned with the palm of the hand if the arm is used and with the kneecap if the thigh is used. Positioning the gauge in this manner will make it easier for you to read the dial.

l. **Locate Pulse.** Put the earpieces of the stethoscope in your ears (plastic tips forward) and use the diaphragm to find the patient's pulse.

(1) If the upper arm is being used, you will use the brachial pulse found just below the crease on the inside of the elbow (figure 5-8).

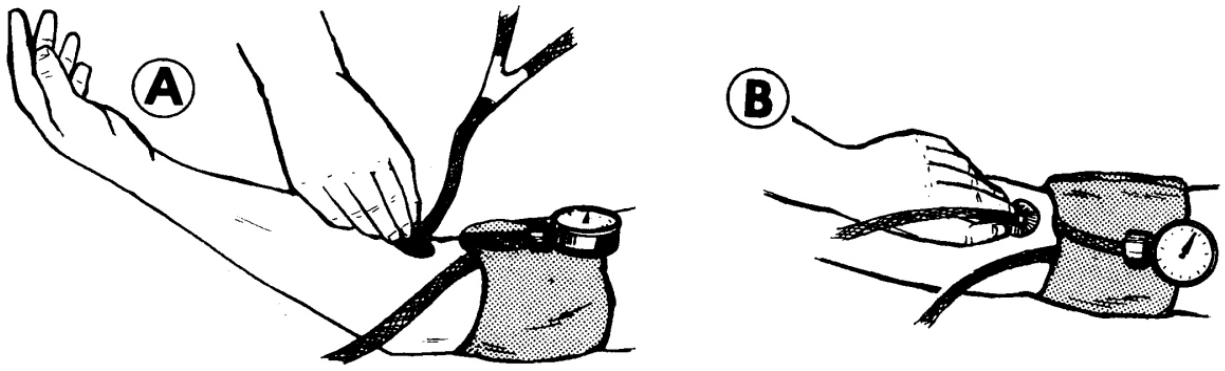


Figure 5-8. Locating brachial pulse. A Side view. B Top view

(2) If the thigh is being used, use the popliteal pulse just above the crease on the inside of the knee.

(3) If you are using a combination stethoscope (both disk and bell) and you cannot hear anything, find the lever near the diaphragm and flip it. This will change the source of sound input from the bell to the disk.

m. **Tighten Screw.** Make sure that the valve is completely closed so that the air cannot escape.

n. **Inflate the Bladder.** Inflate the bladder (figure 5-9) by squeezing and releasing the handbulb. Listen to the patient's pulse and watch the gauge as you pump up the bladder. When you can no longer hear the pulse beat, note the reading on the gauge. Then pump the handbulb again until it reads 10 mm Hg higher than it did when the pulse disappeared or until the pressure of 140 mm Hg is reached, whichever is greater.

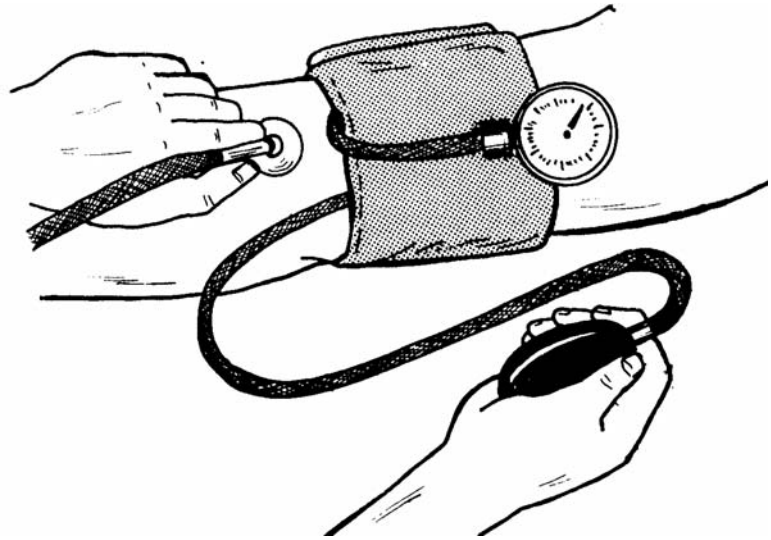


Figure 5-9. Inflating the bladder.

CAUTION: Do not inflate the bladder to a pressure greater than 200 mm Hg. If the pulse can still be heard at 200 mm Hg, deflate the bladder (unscrew the valve) and remove the bladder from around the patient's arm or thigh. Then notify your supervisor of the problem.

o. **Listen for Pulse.** Once you have inflated the bladder to the desired pressure (140 mm Hg or higher, depending upon when the pulse disappeared) listen briefly to make sure that you cannot hear the pulse beat below the bladder.

(1) If you cannot hear the pulse, then the air pressure inside the bladder is greater than the systolic pressure of the blood. (The bladder is, in effect, now a tourniquet.) You are now ready to begin releasing the air from the bladder.

(2) If the pulse can still be heard, inflate the bladder until the pulse disappears, then inflate it an extra 10 mm Hg of pressure. Do not inflate above 200 mm Hg.

p. **Release Air Slowly.** Watch the gauge closely and listen through the stethoscope as you release air from the bladder. Air is released from the bladder by rotating the release valve (screw) counterclockwise (figure 5-10). The more the screw is turned, the larger the opening and the faster the air escapes. You want the air to escape slowly enough so that you can tell at what pressure reading the pulse reappears, but fast enough that the continued pressure does not harm the patient or cause unnecessary discomfort.

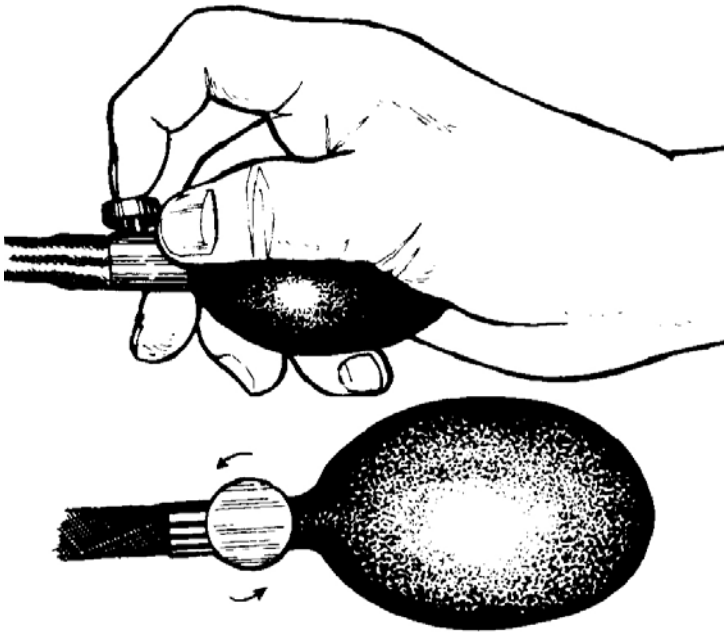


Figure 5-10. Rotating the screw counterclockwise to release pressure.

(1) The process of taking a patient's blood pressure (beginning at the time you start inflating the bladder and ending at the time you completely release the pressure) should take less than two minutes. Do not leave an inflated bladder wrapped around the patient's limb for more than two minutes.

(2) If you are having problems that will result in going over the two minute mark, deflate the bladder, remove the bladder from around the patient's limb, and wait at least one minute before trying to take his blood pressure again.

q. **Listen for Pulse.** The point at which you hear the pulse beat return is the patient's systolic pressure. Note the reading on the gauge when you hear the first distinct sound of a pulse beat.

(1) The markings on the gauge will mark off readings (130, 132, 134, etc.). When you record blood pressure readings, record the reading to the nearest even number (for example, 128 instead of 127).

(2) Normally, you will remember the patient's systolic reading and not write it down until you have the determined his diastolic reading also. Writing the number down distracts you from listening to the pulse and watching the gauge as the air continues to escape.

r. **Continue to Release Pressure.** After you identify the patient's systolic pressure, continue to listen to the pulse and watch the gauge as the air continues to escape from the valve. The air should be escaping at a rate that does not require you to adjust the airflow (turn the screw).

s. **Listen for Last Distinct Sound.** As long as the air pressure in the bladder is greater than the diastolic pressure, the artery will collapse after each pulse beat. This makes the pulse have distinct sound. Once the air pressure in the bladder is less than the diastolic pressure of the blood, the artery will remain open at all times. This means that you will be hearing the sound of continuous blood flow in addition to the blood surge caused by the pulse. The pulse will sound muffled and not distinct. The point at which the distinct pulse sound changes to a muffled sound marks the diastolic pressure.

(1) Often the pulse will sound louder just before the diastolic pressure is reached.

(2) A change in rhythm may also occur at the diastolic level.

(3) Sometimes the diastolic is difficult to determine. You may wish to close the valve (turn screw clockwise), inflate the bladder to a point where the pressure is above the diastolic, and release the air at a slower rate than before in order to check yourself.

(4) Like the systolic, the diastolic is determined to the nearest even whole mm Hg.

t. **Release Air.** Once you have determined the patient's diastolic pressure, rotate the screw counterclockwise until the valve is opened as far as possible. This will allow the bladder to deflate rapidly.

u. **Verify Readings, if Needed.** If you are not sure that the blood pressure readings (both systolic and diastolic) are correct, squeeze all the air out of the bladder while it is still wrapped around the patient's arm and repeat steps m through t. The blood pressure can usually be checked quickly because you already know the patient's approximate blood pressure readings. This means that you will usually inflate the bladder quickly to a pressure about 10 mm Hg above the first reading, release the air slowly until the first pulse is heard, release air little faster, and then slow the air flow down when you approach the level of the diastolic reading. If the second set of readings is very different from the first, remove the bladder from the patient's limb, force the remaining air out, wait one minute, and take his blood pressure again.

v. **Record Readings.** Record the systolic and diastolic readings. The systolic is written first and is separated from the diastolic by a diagonal line. For example, a systolic of 120 and a diastolic of 80 is written "120/80." Both reading are recorded as whole, even numbers.

w. **Remove Bladder.** Remove the bladder from around the patient's arm or thigh, force the remaining air out of the bladder, and close the valve.

x. **Assist Patient, If Needed.** Assist the patient as needed. For example, you may need to help the patient with his shirt or pajamas.

y. **Clean Earpieces.** If you are not going to continue using the stethoscope, clean the earpieces again. Use the same procedures as previously described in paragraph d.

z. **Return Equipment.** If you will no longer need the sphygmomanometer and stethoscope, return them, along with any other equipment used, to their proper storage area.

5-7. CAN I TAKE A PATIENT'S BLOOD PRESSURE WITHOUT A STETHOSCOPE?

Sometimes the noise level of your work area may make it very difficult to listen to the patient's pulse with a stethoscope or you may not have a stethoscope available. In such cases, use your fingertips (not your thumb) to feel the pulse instead of using a stethoscope to listen for the pulse. The following steps summarize how this procedure is performed.

a. **Position the Patient.** Position the patient so that you can easily take the patient's pulse.

b. **Locate Pulse.** Locate the patient's pulse (inside elbow or knee).

c. **Place and Inflate Bladder.** Wrap the bladder around the patient's upper arm or thigh, as appropriate. (The bladder must be placed between the pulse site and the patient's heart.)

d. **Inflate Bladder to Starting Point.** Inflate the bladder while continuing to feel the patient's pulse. Inflate the bladder until you feel the pulse stop; then inflate it another 10 mm Hg.

NOTE: Inflate the bladder to at least 140 mm Hg, but not more than 200 mm Hg.)

e. **Release the Air Slowly.** Turn the valve so that air escapes. Continue to feel for a pulse and continue to watch the gauge.

f. **Determine Systolic.** The systolic is the pressure at which you feel the first pulse beat return.

g. **Determine Diastolic.** The diastolic is the pressure at which the pulse changes to a less distinct (more normal) pulse. The diastolic measurement is only an approximation since it is usually difficult to determine the diastolic using this method.

h. **Release Air.** Open the valve fully in order to relieve the pressure as quickly as possible.

i. **Verify Readings, If Needed.** If you wish to check your results, squeeze the air out of the bladder, close the valve, and repeat the procedure.

j. **Record Readings.** Write the patient's readings (systolic/diastolic) on the form or paper. Remember that both readings are to be even whole numbers.

k. **Remove Bladder.** Remove the bladder from the patient's arm or thigh. Also assist the patient to adjust his clothing or position as needed.

l. **Return Equipment.** If you are not going to take another patient's blood pressure, return the sphygmomanometer to the proper storage area.

Continue with Exercises

EXERCISES: LESSON 5

INSTRUCTIONS. The following exercises are to be answered by marking the lettered response that best answers the question or completes the statement, by writing the answer in the space provided, or by performing the action indicated. After you have completed all the exercises, turn to "Solutions to Exercises" at the end of the lesson and check your answers.

1. Can blood pressure be described by a single number like other vital signs?

   a. Yes.

   b. No.

2. An adult patient has a systolic pressure of 120 mm Hg and a diastolic pressure of 80 mm Hg. Which of the following statements is true?

   a. The patient's blood pressure readings are within normal range of a male, but not a female.

   b. The patient's blood pressure readings are within the normal range for a female, but not a male.

   c. The patient's blood pressure readings are within the normal range for both males and females.

   d. The patient's blood pressure readings do not fall within the normal readings for either males or females.

3. In order to release air from the bladder, you:

   a. Disconnect the handbulb from the tubing.

   b. Turn a screw near the handbulb.

   c. Open the stopper valve on the bladder itself.

   d. Flip the airflow directional switch on the handbulb and use the handbulb to pump the air out of the bladder.

4. When you put the earpieces of a stethoscope into your ears, you should have the tubing of the earpieces pointing:

   a. Forward.

   b. Toward the rear.

5. You have properly placed the bladder of the sphygmomanometer around a patient's upper arm. The bladder is inflated to a pressure of 130 mm Hg. There is no pulse in the artery below the point where the bladder is applied. Which of the following statements is true concerning this situation?

   a. The patient's systolic pressure is greater than 130 mm Hg.

   b. The patient's systolic pressure is less than 130 mm Hg.

   c. Nothing can be determined concerning the patient's blood pressure because the artery is collapsed.

SPECIAL INSTRUCTIONS FOR EXERCISE 6 THROUGH 11. For each substance, activity, or condition listed below which tends to increase (raise) a person's blood pressure, write an "I" in the blank preceding the substance, activity, or condition. If the substance, activity, or condition usually results in a decreased (lower) blood pressure, write a "D" in the blank.

_____ 6. Overweight.

_____ 7. Growing older.

_____8. Vasodilator drug.

_____ 9. Arteriosclerosis.

_____10. Eating.

_____11. Wound with a large amount of bleeding.

12. When taking a person's blood pressure, you should inflate the bladder to an initial pressure that is at least _____ mm Hg but not more than _____ mm Hg.

13. You are having some problems determining a patient's blood pressure using his popliteal artery. You should not keep an inflated bladder around the patient's thigh for more than _____ minute(s).

14. If you cannot use a stethoscope, you can still take a patient's blood pressure by

    _____.

15. Practice taking a person's blood pressure. You should have an experienced person observe you while you determine the "patient's" systolic and diastolic pressure. Then have the experienced person take the person's blood pressure.

Check Your Answers on Next Page

SOLUTIONS TO EXERCISES: LESSON 5

1. b (takes two numbers) (para 5-1)
2. c (paras 5-2a(1), (2); b(1),(2))
3. b (para 5-4a(4))
4. a (para 5-4b(3))
5. b (para 5-5b(2)
6. I (para 5-3e)
7. I (para 5-3b)
8. D (para 5-3k)
9. I (para 5-3a(3))
10. I (para 5-3l)
11. D (para 5-3m)
12. At least 140 mm Hg but not more than 200 mm Hg (para 5-6n, Caution).
13. Two minutes (para 5-6p(1))
14. Feeling (palpating) the pulse instead of listening through the stethoscope (para 5-7).
15. Follow the procedures given in para 5-6. Your systolic reading should be within 4 mm Hg (plus or minus) of the systolic reading obtained by the experienced person. Your diastolic reading should also be within ±4 mm Hg of the diastolic reading obtained by the experienced person.

End of Lesson 5

LESSON ASSIGNMENT

LESSON 6	Recording Vital Signs.
LESSON ASSIGNMENT	Paragraphs 6-1 through 6-3.
LESSON OBJECTIVES	After completing this lesson, you should be able to:

6-1. Identify general rules for recording a patient's temperature, pulse rate, breathing rate, and blood pressure.

6-2. Identify forms on which vital signs are recorded and when the forms are used.

6-3. Record vital signs on a DA Form 3950.

6-4. Determine a patient's vital signs from a SF 511.

SUGGESTIONS After completing the assignment, complete the exercises of this lesson. These exercises will help you to achieve the lesson objectives.

LESSON 6

RECORDING VITAL SIGNS

6-1. WHAT ARE SOME OF THE FORMS ON WHICH VITAL SIGNS ARE RECORDED?

Some of the forms on which vital signs are recorded are discussed below.

a. **SF 510.** Standard Form 510, Nursing Notes, is used to record the patient's vital signs and other information when he first enters the hospital. Other entries pertaining to the nursing care provided are made throughout the patient's hospitalization. Only registered nurses and approved personnel make entries on this form and all entries are made in ink. An example of a SF 510 with an initial (admitting) entry is shown in figure 6-1.

b. **SF 511.** While the patient is in the hospital, his vital signs are recorded on Standard Form 511, Vital Signs Record. Entries on this form are made in ink. Only authorized medical personnel make entries on this form. An example of a SF 511 is shown in figure 6-2. Because of the graphic section on the form, the form is also known as the "TPR graphic."

c. **SF 600.** Standard Form 600, Chronological Record of Medical Care, is used to record medical care that the person receives on an outpatient (not in hospital) basis. A common place where entries are made on a SF 600 is the troop medical clinic (TMC). Entries on this form are made in ink. Only authorized personnel make entries on this form. An example of a SF 600 is shown in figure 6-3.

d. **DD Form 1380.** Department of Defense Form 1380, US Field Medical Card, is shown in figure 6-4. This card is carried by combat medics in the field. When a soldier is injured, the medic who treats the soldier records information on the card. The soldier's name and unit, the type of injury, the cause of injury, the treatment given to the patient, and the patient's vital signs before being evacuated are some of the information entered on the card. The card is then attached to the injured soldier's clothing by looping the wire at the end of the card through a buttonhole on the soldier's uniform. Additional treatment provided during evacuation is also entered on the card by the person who gives the care. The information on the Field Medical Card is transferred at the appropriate time to another form. The Field Medical Card then becomes a part of the soldier's permanent medical records.

510-112 NSN 7540-00-634-4123

MEDICAL RECORD

NURSING NOTES
(Sign all notes)

DATE	HOUR A.M.	HOUR P.M.	OBSERVATIONS Include medication and treatment when indicated
3 NOV 95	0800		25 y/o white male admitted ambulant from
			GI clinic with diagnosis of duodenal ulcer. Presenting
			Complaint was intermittant epigastric pain. Complains
			of "mild" pain at present. In no acute distress.
			TPR 98°-86-16. BP 106/72. Scheduled for
			elective surgery on 6 Nov 95
			Sylvester Anderson CPT ANC

(Continue on reverse side)

PATIENT'S IDENTIFICATION *(For typed or written entries give: Name–last, first, middle; grade; rank; rate; hospital or medical facility)*

REGISTER NO.

WARD NO.

NURSING NOTES
Medical Record

STANDARD FORM 510 (Rev. 7-91)
Prescribed by GSA/ICMR, FIRMR (41 CFR) 201-9.202-1

Figure 6-1. Example of a SF 510, Nursing Notes, showing an admitting entry.

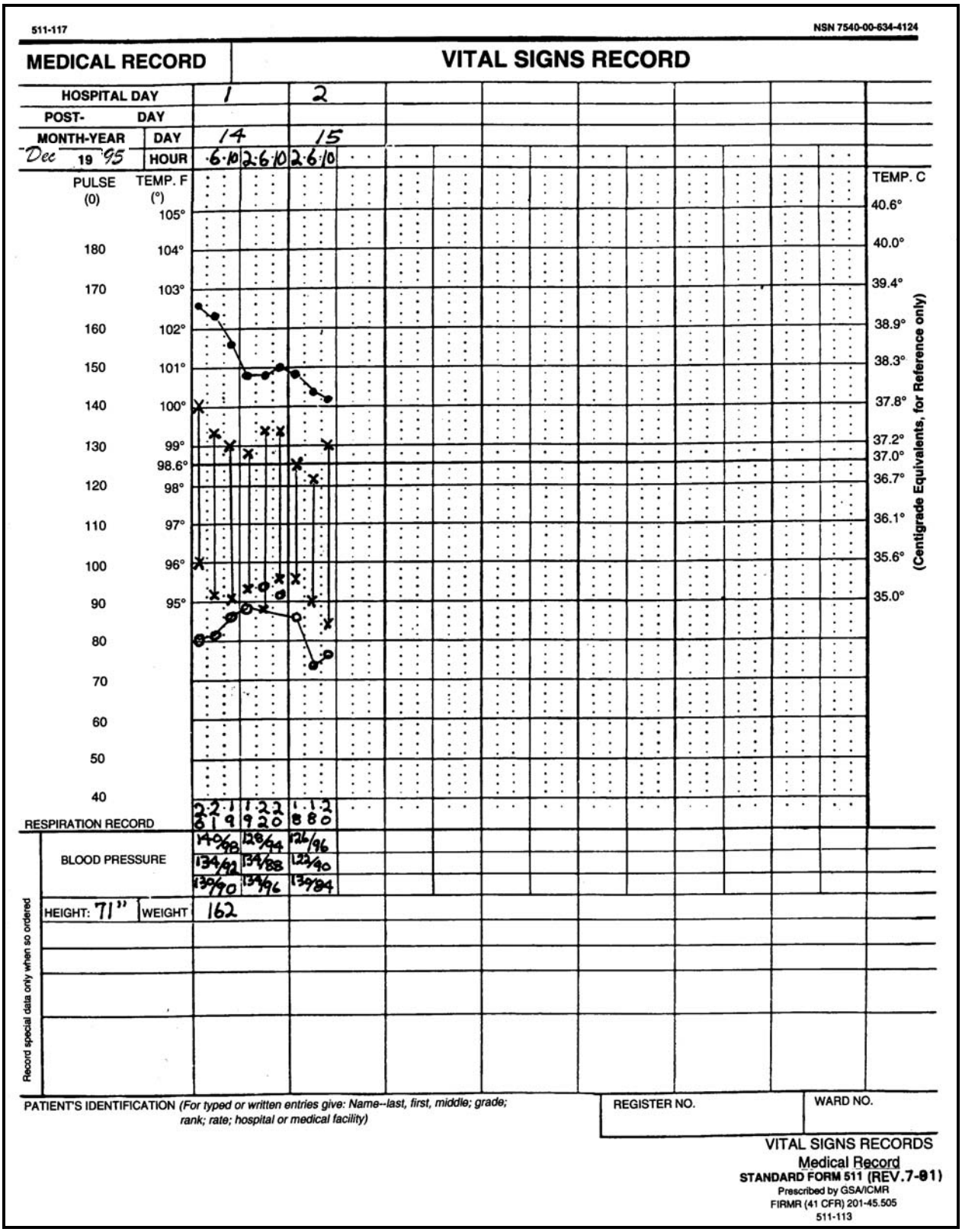
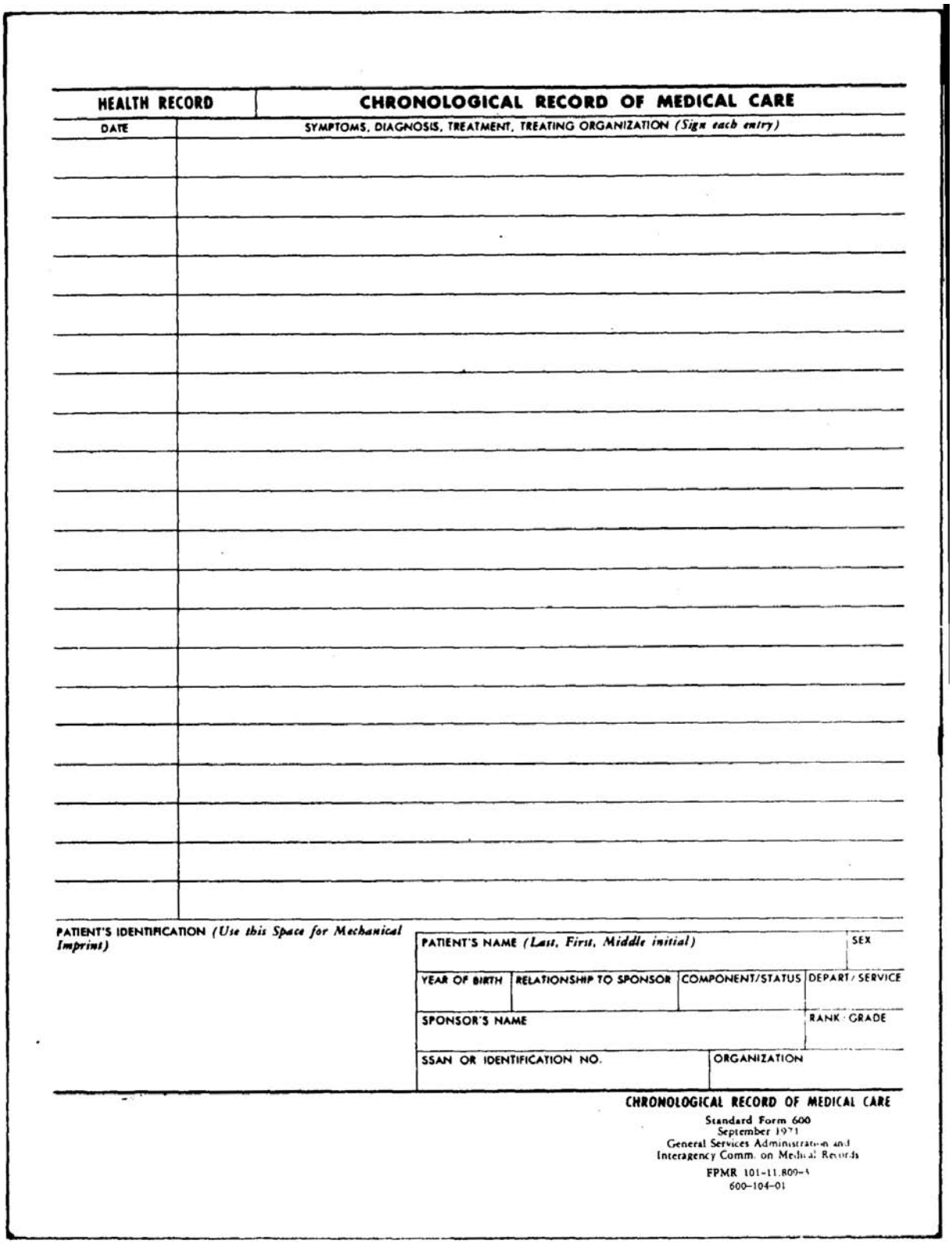


Figure 6-2. Example of a SF 511, Vital Signs Record, showing vital signs entries.

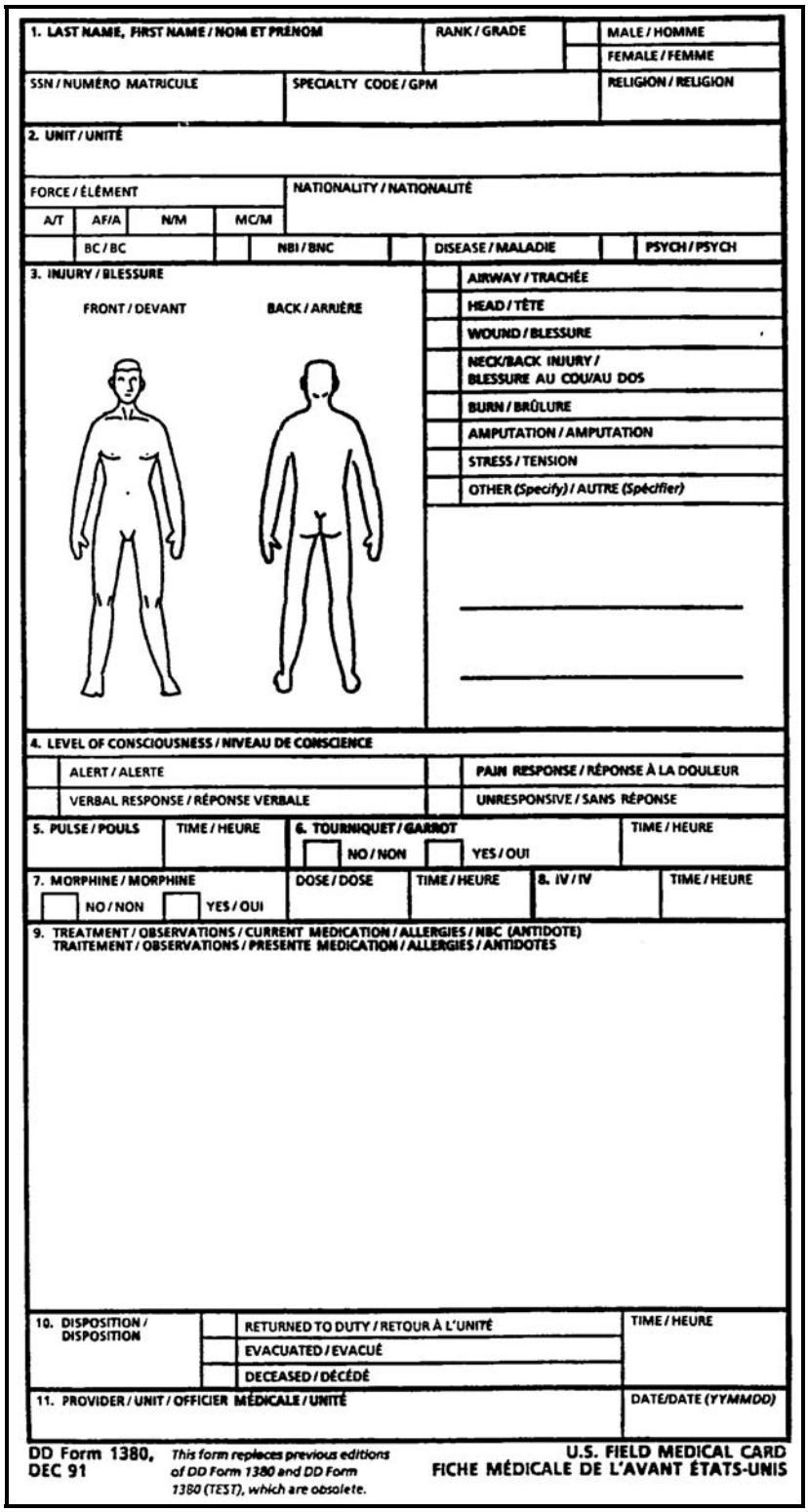


HEALTH RECORD	CHRONOLOGICAL RECORD OF MEDICAL CARE
DATE	SYMPTOMS, DIAGNOSIS, TREATMENT, TREATING ORGANIZATION *(Sign each entry)*

PATIENT'S IDENTIFICATION *(Use this Space for Mechanical Imprint)*	PATIENT'S NAME *(Last, First, Middle initial)*			SEX
	YEAR OF BIRTH	RELATIONSHIP TO SPONSOR	COMPONENT/STATUS	DEPART./ SERVICE
	SPONSOR'S NAME			RANK · GRADE
	SSAN OR IDENTIFICATION NO.		ORGANIZATION	

CHRONOLOGICAL RECORD OF MEDICAL CARE
Standard Form 600
September 1971
General Services Administration and
Interagency Comm. on Medical Records
FPMR 101-11.809-5
600-104-01

Figure 6-3. Example of a SF 600, Chronological Record of Medical Care, showing vital signs entry



1. LAST NAME, FIRST NAME / NOM ET PRÉNOM
RANK / GRADE
MALE / HOMME
FEMALE / FEMME
SSN / NUMÉRO MATRICULE
SPECIALTY CODE / GPM
RELIGION / RELIGION
2. UNIT / UNITÉ
FORCE / ÉLÉMENT
A/T
AF/A
N/M
MC/M
NATIONALITY / NATIONALITÉ
BC / BC
NBI / BNC
DISEASE / MALADIE
PSYCH / PSYCH
3. INJURY / BLESSURE
FRONT / DEVANT
BACK / ARRIÈRE
AIRWAY / TRACHÉE
HEAD / TÊTE
WOUND / BLESSURE
NECK/BACK INJURY / BLESSURE AU COU/AU DOS
BURN / BRÛLURE
AMPUTATION / AMPUTATION
STRESS / TENSION
OTHER (Specify) / AUTRE (Spécifier)
4. LEVEL OF CONSCIOUSNESS / NIVEAU DE CONSCIENCE
ALERT / ALERTE
PAIN RESPONSE / RÉPONSE À LA DOULEUR
VERBAL RESPONSE / RÉPONSE VERBALE
UNRESPONSIVE / SANS RÉPONSE
5. PULSE / POULS
TIME / HEURE
6. TOURNIQUET / GARROT
NO / NON
YES / OUI
TIME / HEURE
7. MORPHINE / MORPHINE
NO / NON
YES / OUI
DOSE / DOSE
TIME / HEURE
8. IV / IV
TIME / HEURE
9. TREATMENT / OBSERVATIONS / CURRENT MEDICATION / ALLERGIES / NBC (ANTIDOTE)
TRAITEMENT / OBSERVATIONS / PRESENTE MEDICATION / ALLERGIES / ANTIDOTES
10. DISPOSITION / DISPOSITION
RETURNED TO DUTY / RETOUR À L'UNITÉ
EVACUATED / EVACUÉ
DECEASED / DÉCÉDÉ
TIME / HEURE
11. PROVIDER / UNIT / OFFICIER MÉDICALE / UNITÉ
DATE/DATE (YYMMDD)
DD Form 1380, DEC 91
This form replaces previous editions of DD Form 1380 and DD Form 1380 (TEST), which are obsolete.
U.S. FIELD MEDICAL CARD
FICHE MÉDICALE DE L'AVANT ÉTATS-UNIS

Figure 6-4. Example of a DD Form 1380, U.S. Field Medical Card. (This card is also used by North Atlantic Treaty Organization—NATO-- troops. Therefore, the section titles are given in both English and French.):

e. **DA Form 3950.** The four previous forms become part of the patient's permanent medical records. The first three are filled out neatly in ink. The Department of Army Form 3950, Flowsheet for Vital Signs and Other Parameters (see figure 6-5) is different. It is a worksheet you can use to record a patient's vital signs as you take them. You or someone else can then neatly transfer the information to a permanent form (usually the SF 511) later. When all of the information has been transferred, the DA Form 3950 can be destroyed.

NOTE: Your local SOP may require that the DA Form 3950 be kept for a certain length of time before being destroyed in case some of the information transferred to the SF 511 needs to be verified.

6-2. HOW IS A DA FORM 3950 COMPLETED?

If you are taking vital signs on a ward, you will probably enter your readings on the DA Form 3950. The form provides room to record the vital signs for several patients over an extended period (normally one day).

a. **Identification Information.** The name of the patient's are entered in the first column on the right. The time (approximate military time) that you are taking the vital signs is entered in the heading of the next column. Normally, vital signs are taken every 4 hours (6 times a day).

b. **Vital Signs Information.**

(1) <u>The patient's temperature.</u> The patient's temperature, pulse rate, and breathing (respir rate are entered in that order. The sets of numbers are normally separated by a hyphen to make reading easier. Temperature readings with tenths are normally written with the tenths raised (for example, 98^{6}). The degree symbol and Fahrenheit or Celsius symbol are not written in order to save space. For example, figure 6-5 shows that Mr. Jones' vital signs at 1400 were:

(a) Temperature: 100.0º F.

(b) Pulse rate: 86 beats per minute.

(c) Breathing rate: 19 breaths per minute.

FLOWSHEET FOR VITAL SIGNS AND OTHER PARAMETERS
For use of this form, see AR 40-407; the proponent agency is the OTSG

WARD: 7 East

This form may be used for more than one day by drawing a heavy line and adding date. Insert column headings as required.

DATE: 14 Dec 1995

	PATIENT'S NAME	0200	0600	1000	1400	1800	2200	
	Jones, Donald				100-86-19	136/90 101-84-19		

DA FORM 3950, JUN 91 Previous editions are obsolete. *U.S. Government Printing Office: 1991 - 281-485/40291

Figure 6-5. Example of a DA Form 3950, Flowsheet for Vital Signs and Other Parameters, with vital signs entries.

(2) Blood pressure. When a patient's blood pressure is taken, it is recorded in the same block as the TPR readings, but above those readings. The systolic-slash-diastolic form is used. The abbreviation "mm Hg" is not entered in order to save space. At 1600, Mr. Jones' vital signs were taken again. This time, his blood pressure was also taken. His blood pressure readings were:

(a) Systolic: 136 mm Hg.

(b) Diastolic: 90 mm Hg.

c. **General Rules.** The readings recorded on the DA Form 3950 conform to general rules given previously in this subcourse. These rules are summarized below.

(1) All Fahrenheit temperatures are to be rounded to the nearest two-tenths of a degree.

(2) All Celsius temperatures are to be rounded to the nearest one-tenth of a degree.

(3) All rectal temperatures are to have a circled "R " above the temperature reading.

(4) All axillary temperatures are to have a circled " A " above the temperature reading.

(5) All temperatures without a special symbol are understood to be oral temperatures.

(6) All pulse rates are to be recorded in even whole numbers.

(7) All blood pressure readings are to be recorded in even whole numbers. The systolic (highest) pressure is entered in front of the diastolic (lowest) pressure. The systolic and diastolic readings are separated by a slash (diagonal line), such as "130/96."

(8) All breathing rates are recorded as whole numbers. The numbers may be either even or odd.

6-3. HOW IS VITAL SIGNS INFORMATION OBTAINED FROM A SF 511?

Specific instructions for entering information on a SF 511, Vital Signs Record, are not given in this subcourse. However, the instructions given below should be sufficient for you to read vital sign information from the form.

a. **Patient Identification.** The "Patient Identification" section at the bottom gives the patient's name, social security number, hospital (register) number, ward to which the patient is assigned, and other information.

b. **Heading.**

(1) Month-Year/Day. The third line gives the calendar day. The calendar month and year are on the fourth line under "Month-Year."

(2) Hospital Day. The first line tells how many days the patient has been in the hospital. The day that the patient enters the hospital is "hospital day 1."

(3) Post-Day. This line tells how many days it has been since the patient's surgery or since the patient delivered (gave the birth). This line is left blank if it does not apply. For example, "DOS" (day of surgery) is entered on the date that the surgery occurred. The number "1" entered in the next day's column. A "DOD" entry means "day of delivery" (day that the patient gave birth).

(4) Hour. The fourth line is used to record the hours at which the patient's vital signs are taken (not when they are actually recorded on the form).

(a) The graphic section of the form is broken into seven major sets of columns. Each set is used to record the vital signs for a single day.

(b) Each of the seven major columns is divided into two of columns. The first set is used for recording the vital signs taken in the a.m.; the second set is for recording the vital signs taken in the p.m.

(c) Each of the two columns is divided into three columns by dotted lines. Each dotted line column contains a single set of vital signs. This allows six sets of vital signs (one set every four hours) to be recorded each day.

(d) The time that the vital signs are taken is recorded at the top of the column on the fourth line. Civilian time is used. This means that vital signs taken at 0200, 0600, 1000, 1400, 1800, and 2200 (a typical schedule) would have column headings of "2," "6," "10," "2," "6," and "10" respectively.

c. **Vital Signs.**

(1) Pulse. The pulse is graphed as an open or empty circle (o). It is read using the "Pulse" column on the left of the form. Each solid horizontal line denotes 10 beats per minute. There are four dots between each pair of horizontal lines. Each dot adds two beats per minute to the line below. For example, the patient's pulse rate at 1000 on 15 December 1985 as shown in figure 6-2 is 76. On the SF 511, the pulse rate symbols are connected by straight lines.

NOTE: Solid lines are not drawn through the symbol since that could make the pulse temperature symbol look like a temperature symbol.

(2) Blood pressure. Blood pressure readings are graphed as crossed lines (X). The point that the lines cross indicates the blood pressure reading. There are two X's in each hour column for each blood pressure reading. The higher "X" is the systolic; the lower is the diastolic. They are read using the "Pulse" column. Each solid horizontal line denotes a change of 10 mm Hg and each dot between the solid lines denotes a change of 2 mm Hg. For example, the blood pressure reading for 1000, 15 December, on figure 6-2 is 120/84. The systolic and diastolic readings are connected by a straight line. The systolic reading is not connected to other systolic readings and the diastolic reading is not connected to other diastolic readings. The blood pressure readings may also be written in the "Blood Pressure" section below the graph.

(3) Temperature. The temperature symbol is a large dot or filled circle (●). It is read using the "Temperature" column to the right of the "Pulse" column. Each solid horizontal line denotes a change of 1^{o} F. Each dot represents an additional 0.2^{o} F. For each example, the temperature (oral) reading shown for 1000, 15 December, on figure 6-2 is 100.2^{o} F. Like the pulse symbol, temperature symbols are connected one to another by solid lines.

NOTE: A solid horizontal line is drawn in at the normal (98.6^{o} F) level to aid in your graphing efforts.

(4) Breathing. Breathing rates are not graphed. Instead, the breathing rate is written in at the bottom of the graph column on the "Respiration Record" line.

d. **Other Entries.** The blocks below the "Blood Pressure" section are used as specified by the local SOP. Normally, the top line is used to document weight changes. The rest of the section is usually used to document patient fluid intake and output.

Continue with Exercises

EXERCISES: LESSON 6

INSTRUCTIONS: The following exercises are to be answered by marking the lettered response that best answers the question or best completes the incomplete statement, or by writing the answer in the space provided. After you have completed all the exercises, turn to "Solutions to Exercises" at the end of the lesson and check your answers.

1. In the Army, there _____ form on which vital sign information can be recorded.

   a. Is only one.

   b. Are more than one.

2. Which one of the following forms is a permanent form commonly used to document a person's vital signs readings each time they are taken while he is a patient in a military hospital?

   a. DD Form 1380.

   b. SF 600.

   c. SF 511.

   d. SF 510.

SPECIAL INSTRUCTIONS FOR EXERCISES 3 THROUGH 7. The information below shows information taken from a block on a DA Form 3950. Use this information to fill in the blanks.

128/96 99-80-18

3. The patient's pulse rate is _____.

4. The patient's systolic pressure is _____.

5. The patient's temperature is _____.

6. The patient's diastolic pressure is _____.

7. The patient's breathing rate is _____.

SPECIAL INSTRUCTIONS FOR EXERCISES 8 THROUGH 11.

Based upon the excerpt from an SF 511 shown below, what are the patient's vital signs at 1800 (6 p.m.) on 15 December 1995?

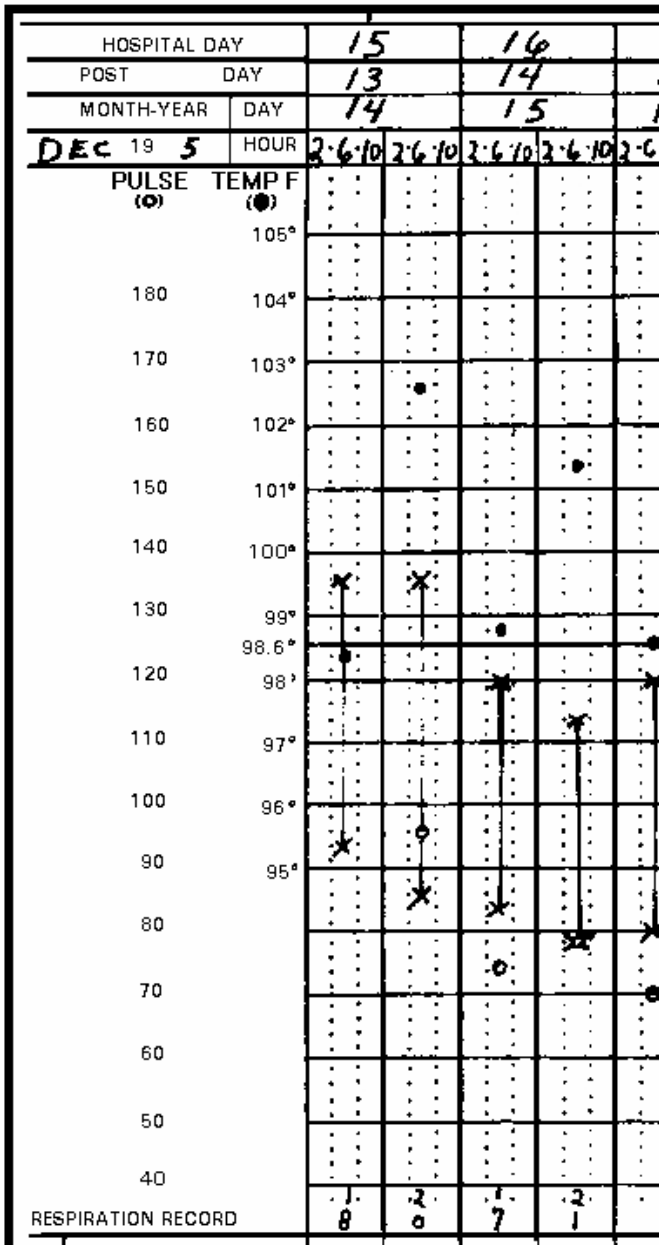
8. The patient's temperature is _____.

9. The patient's pulse is _____

10. The patient's breathing rate is _____.

11. The patient's blood pressure is:

_____



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Check Your Answers on Next Page

SOLUTIONS TO EXERCISES: LESSON 6

1. b (para 6-1)
2. c (para (6-1b)
3. Pulse: 80 para 6-2)
4. Systolic: 128 (para 6-2)
5. Temperature: 99.0^{o}F (para 6-2)
6. Diastolic: 96 (para 6-2)
7. Breathing: 18 (para 6-2)
8. 101.4^{o} F (para 6-3)
9. 78 (para 6-3)
10. 21 (para 6-3)
11. 114/78 (para 6-3)

End of Lesson 6